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Jnl. of The Bombay Natural History Soc.

Vol. 21 · 1912

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गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार
पुस्तकालय

विषय संख्या R 590.5
पुस्तक संख्या B63J
आगत पंजिका संख्या V.21/3

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कोई विद्यार्थी पन्द्रह दिन से अधिक पुस्तक नहीं रख सकता।

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48960

THE
JOURNAL
OF THE
BOMBAY NATURAL HISTORY SOCIETY.

Ra/K
58/13

EDITED BY

W. S. MILLARD,

R. A. SPENCE and N. B. KINNEAR.

VOL. XXI, NO. 3.

मानीकरण ११.८४-११

Date of publication, 30th July 1912.

Price to Non-Members ... ... *Rs. 12–0.*

PRINTED AT THE TIMES PRESS.

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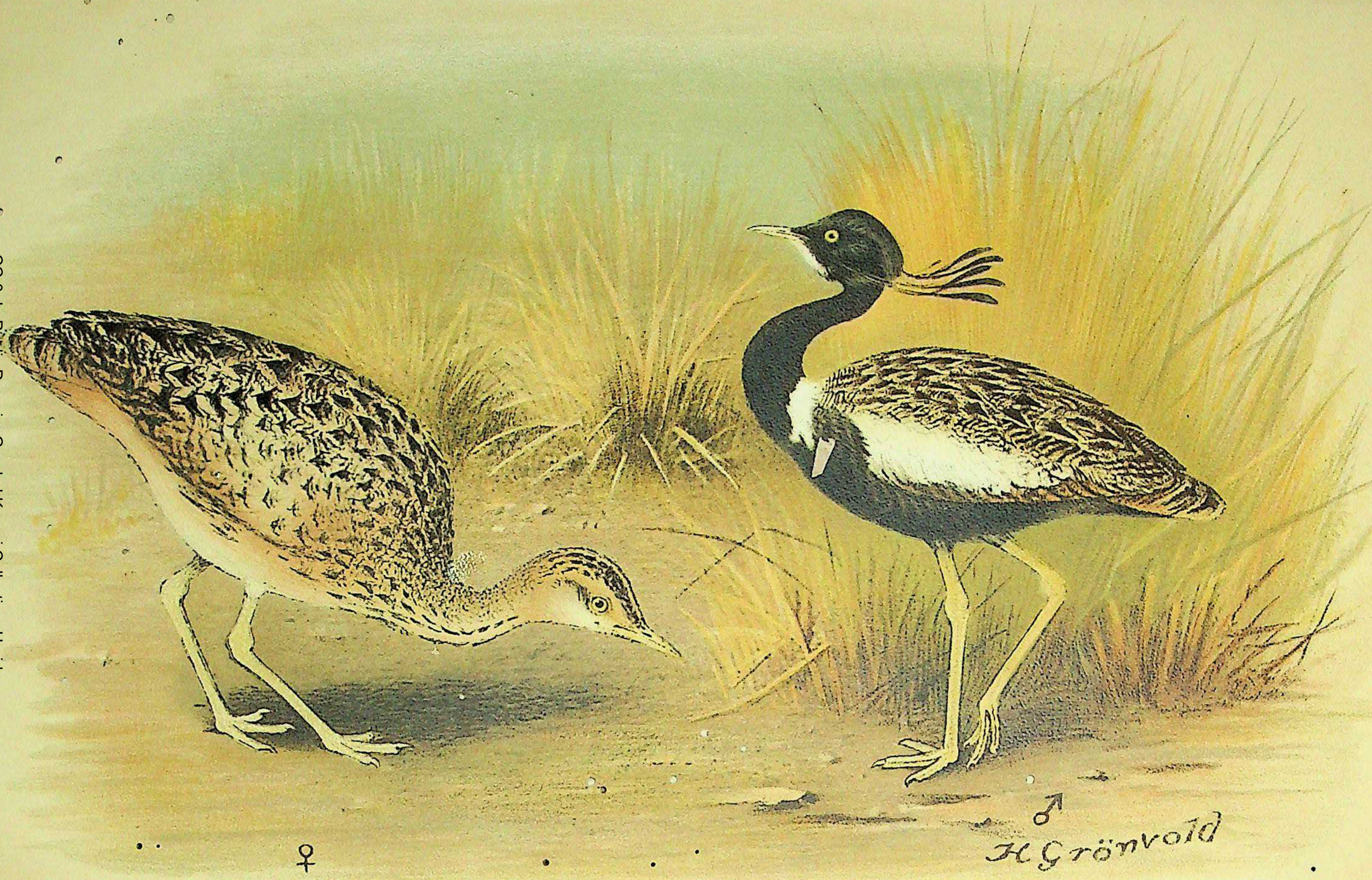


THE LESSER FLORICAN OR LIKH (Sypheotis aurita).

$\frac{1}{4}$ *natural size.*

JOURNAL
OF THE
Bombay Natural History Society.

JULY 1912. VOL. XXI. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VII.

With Plates VII and A & B.

(Continued from page 337 of this Volume.)

Genus—*SYPHEOTIS.*

The principal generic distinction between the birds of this genus and other Bustards is the greater comparative length of the legs. The tarsus in *Sypheotis* is equal to rather more than ⅓rd the length of the wing, whereas in all other Bustards it is only equal to ¼th. The chief generic characteristic relied on by Blanford is the supposed fact of the males putting on a seasonal breeding plumage. It, however, now seems quite certain that the male *Sypheotis bengalensis* retains this adult plumage, when once fully acquired, throughout the year, though the smaller bird, *Sypheotis aurita*, does, on the contrary, acquire an annual nuptial plumage. The primary quills of both species are notched on the inner web and are very attenuated, but especially so in *aurita*.

In the breeding season the males of both species, and during the whole year the fully adult males of *Sypheotis bengalensis*, have the head and the whole of the lower parts black and both species acquire ornamental plumage either on the head or neck. *Sypheotis bengalensis* is crested and has long, full feathers all down the neck to the breast, whilst *Sypheotis aurita* has the feathers of the side of the head and chin somewhat lanceolate and lengthened, and a curious tuft of long feathers from each side of the head below the ear coverts, the longest of which have the stems narrowly webbed and the ends spatulate.

Sharpe divides *Sypheotis* into two genera, creating a new genus *Houbaropsis* for the larger bird and retaining *Sypheotis* for the smaller. The fact of the latter having a seasonal change of plumage and the former not having one would add considerable strength to the reasons for dividing them, but for the purpose of this work I retain them in the one genus.

KEY TO THE SPECIES.

Wing 7″ to 10″; tarsus 3·35″ to 4·5″ ... *S. aurita.*
Wing 13″ to 15″; tarsus 5″ to 6·2″ ... *S. bengalensis.*

SYPHEOTIS AURITA.

The Lesser Florican or Likh.

? *Otis indica.*—Gm. Syst. Nat. i, p. 725; Lath. Ind. Orn. ii, p. 661; Oates. Cat. Eggs B. M. ii, p. 87; Sharpe Hand-l. i, p. 175.

Otis aurita.—Lath. Ind. Orn. ii, p. 660.

Otis marmorata.—Gray and Hardw. Ill. In. Orn. 1, pl. 60.

Sypheotides aurita.—Less. Rev. Zool., 1839, p. 47; Blyth, Cat. B. Mus. As. Soc., p. 259; Jerdon, B. of Ind. iii, p. 619; King, J. A. S. B. xxxvii, part 2, p. 216; MacMaster, *ibid,* xl, part 2, p. 215; Stoliczka, *ibid,* xii, part 2, p. 250; Gould, B. of Asia, vii, pl. 57; Hume, Str. Feath. i, p. 136, 228; Adam, *ibid,* p. 393; *id, ibid,* ii, p. 339; Ball, *ibid,* p. 428; LeMess, *ibid,* iii, p. 379; Blyth, B. of Burm., p. 152; Butler, Str. Feath. iv, p. 10; Fairb., *ibid,* p. 262, 266; Butler, *ibid,* v, p. 231; Ball, *ibid,* p. 419; Hume and Marsh., Game B. i, p. 34; iii, p. 425; Hume, Cat. No. 839; *id,* Str. Feath. viii, p. 111; MacInroy, *ibid,* p. 491; Butler, Cat. Bird. of Sind, etc., p. 56; *id,* Cat. B. S. Bom. Pres.,

p. 71; Vidal, Str. Feath. ix., p. 77; Davidson, *ibid,* x., p. 318; Hume, *ibid,* p. 412; Barnes, B. of Bom., p. 322; Murray Vert. Zool. Sind, p. 220; Barnes Jour., B. N. H. Soc. i, p. 57; *id, ibid,* vi, p. 13; Laurie, *ibid,* p. 94; Littledale, *ibid,* p. 199; Davidson, *ibid,* xii, p. 64; Dewar, *ibid,* xvi, p. 495.

Eupoditis aurita.—Gray, Cat. Mamm., etc., Nepal Cres. Hodgson, p. 130; *id,* Hand-b. B., iii, p. 9.

Sypheotis aurita.—Hume, Nests and Eggs, Ind. B., p. 561; Oates, 2nd Ed., *ibid,* iii, p. 380; Blanford, Avi., B. I., iv., p. 198; Sharpe, Birds of B. M., xxiii, p. 313; *id,* Oates, Game B. of Ind. i, p. 419; Finn, In. Waders, p. 125; Symons, Jour., B. N. H. Soc., xix, p. 261; R. K., *ibid,* p. 995.

Vernacular Names.—Ker-mor, *Guzerat*; Sun-mor, *Deccan and Marathi Districts*; Chini-mor, *Belgaum*; Khartitar, *Bheels*; Likh, Chota Charat, *N.-W. Provinces*; Charas, Chulla Charas, *Southern India*; Kannoul, *Kanarese*; Niala nimili, *Telugu*; Wurragu Koli, *Tamil*; Bursati or Kala Tugder, *Rhotak, Gurgaon.*

Description—Adult Male.—Whole head and neck, including ear-plumes glossy black; chin and centre of upper throat pure white. Remainder of underparts black; the breast, like the head and neck, is a deep velvety black, often highly glossed, but the abdomen is less glossy and this and the undertail coverts are sometimes rather dingy and brownish. Below the hind neck and between this and the back there is a broad band of white which descends as far as the upper breast, often encroaching upon it for almost an inch on either side. Upper plumage a sandy buff, each feather with the centre having a spear-shaped black, or brownish black, patch margined with yellowish sandy, the rest of the feather vermiculated with black or brown. On the lower back the vermiculations are less definite and the central marks obsolete, whilst on the central tail coverts their place is taken by definite cross bars of deep brown. Rectrices sandy buff with a rufous tinge, finely vermiculated as on the back and with four definite cross bars of blackish brown. Scapulars like the back but those nearest the shoulder coverts more or less freckled with white. Larger wing coverts black, the hidden portions of the inner webs freckled with white and brown; remaining median and lesser coverts, where visible, white; the basal portion of the secondary coverts freckled with brown and a few coverts next the inner secondaries approximating these in colouration, but retaining a great deal of white. First two, three, or in some cases four outermost primaries uniform brown; the remainder with broad bars of rufous buff, these widening towards the secondaries. Outer secondaries mottled brown and buff, sparsely freckled with white at the tips, inner secondaries like the back but with white freckling on the edges near the coverts and with the smallest feathers next the scapulars marked with rufous buff.

The feathers of the upper throat are lengthened, those behind the ear coverts being greatly so, the three longest sometimes reaching as much as 5″ in length and generally exceeding 3½″. As a rule the three longest feathers are graduated, and though in some cases they are sub-equal, there is nearly always a great difference in length between these three feathers and the others which may vary between 1″ and 2″. These feathers, more especially the longer ones, are spatulate in shape.

Wing 7·1″ to 8·05″; tarsus 3·35″ to 3·75″; bill at front 1·25″ to 1·5″; tail 3·25″ to 4·5″.

"The irides are dull yellow, sometimes very pale, sometimes brownish; the legs pale, somewhat fleshy yellow, sometimes hoary, sometimes more dusky; the bill is pale yellow, somewhat fleshy towards gape, the ridge, tip and more or less of the upper surface shaded with dusky heavy brown." (Hume).

"Length 17·25″ tc 19″; expanse 27·5 to 32; wing (to end of longest primary) 7·3 to 7·9; tail 4·1 to 4·5; tarsus 3·65 to 3·9; bill from gape 2·0 to 2·1. Weight 14 ozs. to 1 lb. 4 ozs." (Hume.)

"Total length 15 inches, culmen 1·5, wing 7·9, tail 3·5, tarsus 3·5. (Sharpe).

From the above measurements it will be seen that this Bustard varies very considerably in size, but the measurements first given include those of the whole of the British Museum series (some 85 birds), as well as many others which have passed through my hands, so may be taken as shewing fairly satisfactorily the range of variation. The only bird of the British Musem series omitted from the above measurements is an abnormally small bird with a wing of only 6·85″. It may be noticed that I have not given measurements either of length or expanse in describing this or any other bird, but I have omitted these measurements intentionally as they depend far too much upon every individual sportsman's way of measuring and the extent to which wings and neck are stretched during the operation.

Adult female.—Forehead, crown and occiput black, the feathers more or less tipped with buff and the inner webs of the central feathers also buff, forming a well defined mesial streak; lores, fairly well defined supercilium and post orbital region buff with a few black specks and a line of black specks running under the eye; sides of head and ear coverts buff, immaculate or with a few fine specks only; chin, throat and sometimes the region below the ear coverts white. Posterior aspect of the neck buff, finely vermiculated with black, or dark brown, anterior aspect buff, with broad splashes of black forming two broad streaks down to the breast; sides of the neck next the shoulders with similar streaks; breast buff with bold black markings and freckles, the latter often forming crescentic marks. Remainder of lower parts buff, often almost white, the flanks more or less freckled and barred with blackish and the innermost axillaries black.

Back, scapulars, rump and upper tail coverts buff, each feather with a broad central spear head of black, surrounded with buff. These marks disappear on the rump which is more indefinitely marked. Tail, like the back but without the spear head marks and with four broad bands of black. Quills of the wing as in the male. Wing coverts buff, the outer sparsely barred with brown or black, the inner and smaller profusely barred and to some extent freckled with black.

Wing 8·25″ to 9·75″; tarsus 3·55″ to 3·85″; bill at front 1·45″ to 1·65″; tail about 4·5″.

"*Female.*—Length 18 to 21·4; expanse 29 to 36; wing 9·0 to 9·75; tail 4·7 to 5·0; tarsus 3·9 to 4·4; bill from gape 2·28 to 2·3. Weight 1 lb. 2 ozs. to 1 lb. 10 ozs." (Hume).

There are several females in the British Museum collection with wing under 9″, but these are probably young birds. Fully adult birds, *i.e.*, over 18 months, will not often be found with a wing of less than 9″.

Inglis sends me a note on the soft parts of a female shot by him in Behar as follows: "Bill dusky red, culmen dark brown, gape and base of lower mandible yellow; *iris* yellow tinged with red; legs dull dusky yellow."

Adult male in winter plumage.—Similar to the female, but retaining a considerable amount of white on the wing.

Young male.—Like the female.

Nestling.—"An almost uniform dirty pale yellow colour, with an unclosed V (*i.e.* ν) on the crown of the head in dingy black, and blotches, rather stripy, of black on the wing, back and sides, and about the ears; legs and beak a colour between pale blue and pale pink; and on the tip of the beak a little lump of pale pearly white." (Davidson as quoted by Hume.)

Distribution.—In "Game Birds" Hume thus describes the habitat of the Lesser Florican:—

"I find great difficulty in defining the limits within which the Lesser Florican occurs; firstly, because it is irregularly migratory and secondly because individual birds straggle in the most unaccountable manner hundreds of miles beyond the furthest districts which it at all regularly visits."

"Dr. Jerdon tells us that 'this species is found throughout India, from near the foot of the Himalayas to the southermost districts,' but this conveys, I think, a somewhat erroneous idea of its distribution, which is not nearly so wide as this might seem to imply."

"Although a certain number are probably permanent residents of Khandesh, Nasik and Ahmednagar, the real home of the Lesser Florican is in the drier portions of the Peninsula, lying east of the Western Ghats and south and east of the Godavari."

"It is, of course, confined to plains and open country, and does not ascend any of the hills, though a single specimen was once killed, I hear, on the slopes of the Nilgiris, between Neddiwattum and Pykarra, going down to the Wynaad."

"During the rains when it breeds, although many breed in the Deccan, as, for instance, about Sholapur, the majority, I think, move northwards and westwards, extending over the western parts of the Central Provinces, the Central India Agency, the southern and central portions of Rajputana, Khandesh, Guzerat, Cutch, Kathiawar and Southern Sind."

"The migration is, however, irregular, as in some years it extends much further than in others. The birds are plentiful in one year where in the next none or few are to be met with."

"In years when the rainfall is plentiful, they are pretty common during the monsoon a little south of Delhi, in Rohtak and Gurgaon. Generally, there are a good many about Jhansi and so on, but except as stragglers, they are not found in those parts of the country that I know further north than a line joining Sersa and Delhi, nor do they cross the Jumna in any numbers."

"Although I have known single specimens killed near Lucknow, Sultanpur, and other places in Oudh; though I have myself shot single birds occasionally in the Meerut and Etawah districts; though Ball got a specimen in Serguja, Hodgson others in the valley of Nepal; though Jerdon says he has known of their occurrence in Purneah, and Parker tells me they have occurred in Nuddea; though one specimen has been killed on the Mekran Coast near Gwader and another at Sandoway in Arakan, I do not, as at present informed, consider that either Beluchistan, the Punjab, the North-Western Provinces, north and east of the Jumna, Oudh, Chota Nagpore or any part of Bengal or the countries eastwards, can be properly included within its normal range. It occurs nowhere out of India."

It will be seen that Hume refers to a bird shot at Sandoway on the Arrakan Coast. This record is from the *Bengal Sporting Magazine* for 1835, where a writer, on page 151, records the shooting of a Lesser Florican, and this record is quoted by Blyth in his "Birds of Burmah," p. 152. It is, however, extremely doubtful if this record is a really correct one and *Sypheotis aurita* should not be accepted as a Burmese Bird on the strength of it. The next point furthest east from which it has been recorded is Dinajpore, from which place there is a specimen in the British Museum, and further south of this again from Purulia, Purnea and Nadia, from each of which district stragglers are occasionally obtained, but it has never been obtained from any of the districts east of the Teesta or south of the Brahmapootra Rivers, leaving thus a very wide stretch of country or sea to be passed over before the Arrakan Coast is reached.

To Hume's districts of Purnea and Nadia in Bengal, from both of which districts I have also seen specimens, must be added Maldah where birds have been seen and shot by Mr. G. Hennessy.

As regards the Punjab and North-West Provinces, birds wander into these so regularly, year after year, though in but small numbers, that it is hardly possible to regard these Provinces as outside their normal habitat.

In the south, Major Ch. MacInroy says that "Florican are pretty numerous throughout East Mysore, but, for some reason which I cannot divine, are not nearly so much so in the western division of the Province." He further records a bag of 30 birds made some 25 miles from Bangalore and adds that 4 or 5 birds have been killed in a morning near Coconada.

In his list of the Birds of the South Konkan, Vidal remarks that the Lesser Florican "rarely pass the Ghat barrier which divides the Konkan from the Deccan. In seven seasons spent in the Ratnagiri District I have only seen two birds" . . . . "I have also heard of one having been obtained at Dapuli."

Mr. N. S. Symons reports two birds shot near Panwell in the S. Bombay Presidency; and Dewar, it should also be mentioned, notes that it is seen sometimes near and about Madras, but it occurs in that district regularly and is resident, and it extends north into Orissa, Blyth having shot it near Cuttack.

In a footnote, p. 24, of "Game Birds", Hume quotes Hodgson as saying: "Appears here (Valley of Nepal) about middle of May and disappears middle of June" and then he (Hume) goes on to say: "It may be that there is a permanent colony of this species, of which I know nothing as yet, in northern Behar, Gorakhpur, Busti, etc.

In partial confirmation of this surmise Mr. A. E. Osmaston sends me the skin of a young male from Gorakhpur and in the letter sent with it, writes: "I also saw them at the beginning of last rains (1909) but I have never seen them at any other time of the year here and I presume they only come here to breed and I think only a few come even then, as the grassy land they seem to like is very limited in extent."

This record, therefore, though confirming the presence of Likh in and about Gorakhpur during the breeding season does away with the theory of a "permanent colony" and infers that these birds, as well as those which reach Nepal migrate from a good deal further south than Hume imagined. From Bihar Mr. Inglis reports them as decidedly rare and has not seen many himself. He tells me that he has skins of birds shot in Bihar in April and May, in one case that of a male just assuming breeding plumage.

The Lesser Florican is undoubtedly locally migratory, but, as Hume remarks, its migrations are most uncertain and irregular and are probably governed by the state of the rains and food supply and possibly by other factors not yet known either to field naturalists or scientists. At present, all that can be said is that during the breeding season the birds seem to concentrate in suitable places in the centre of their habitat and after this season is over to disperse, more or less, in all four quarters, stragglers then appearing far from any of their favourite haunts. Hill ranges certainly divert and interrupt these local migrations to a great extent wherever met with, and it is more than possible that the bigger rivers, such as the Jumna, may have a similar effect. At the same time, the Lesser Florican does surmount some Hill ranges, for they migrate into the Valley of Nepal, as already recorded, and it has been shot on the Nilgherries as well.

The Likh, or Lesser Florican, is not gregarious like those Bustards with which we have already dealt. In suitable country, of course, many birds may be met with in the same extent of grass land, but they will be found at some distance apart, never in flocks, and though sometimes in pairs yet more often singly, except in the breeding season.

This little Bustard, according to Jerdon, "frequents long grass in preference to any other shelter. It is, however, often to be met with in green fields, in fields of Cotton and Dholl, and, in the Carnatic, so much in those of the grain called *Warragoo*, as to be called in Tamil, Warrago Koler, or Warragoo Fowl."

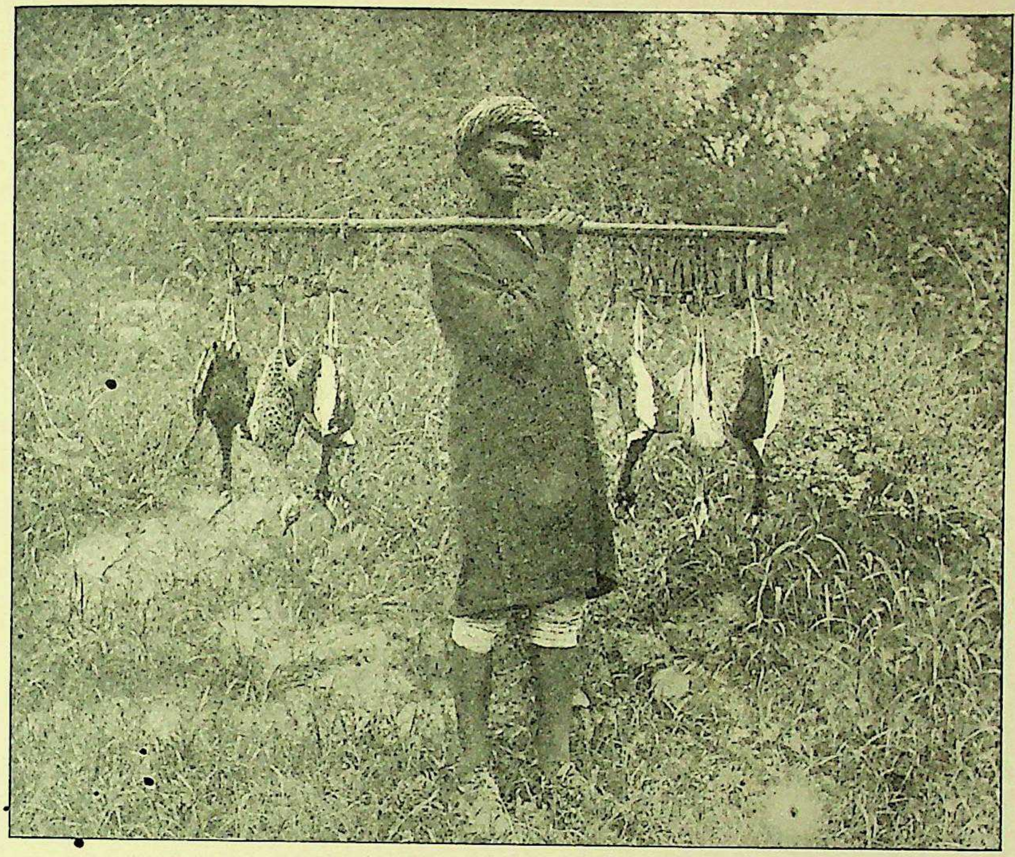
All other writers agree with the above; Hodgson adds hill rice to the crops they frequent and Hume says that they are often found in millet fields, other sportsmen have written to inform me that they have shot them out of bajra, Indian corn, wheat and even young sugarcane. Inglis also informs me that in Behar they are sometimes put up in the indigo fields which affords them good cover.

In fact, the Likh may be found in any crop which is dry under foot, not too dense to make walking difficult and not too high, but preferably they keep to grass land or to grain fields into which they are tempted to feed.

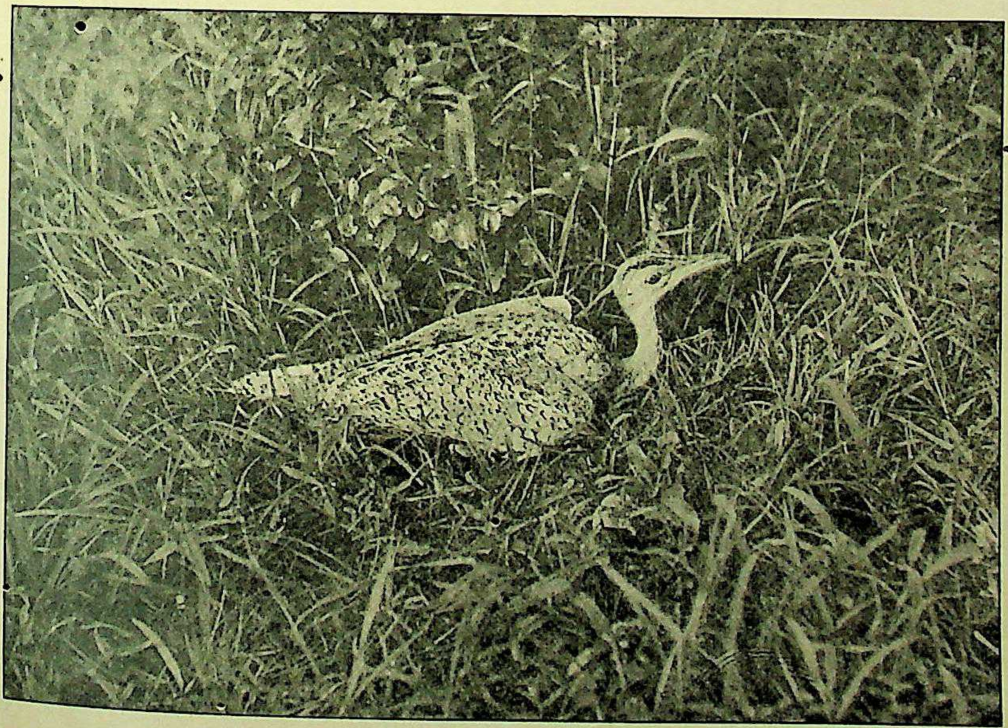
Unfortunately the Likh has a habit during the breeding season of jumping into the air to attract the opposite sex and this has led to its undoing. All the writers quoted by Hume mention this habit and its disastrous effects and Hume himself says. "Owing to the unsportmanlike manner in which these beautiful birds are massacred during the breeding season, they are everywhere diminishing in numbers and will, in another half a century, be, I fear, almost extinct." Mr. J. Davidson also recorded that year by year he noticed a diminution in their numbers in the Deccan. They are not yet extinct, nor have their numbers decreased to the extent Hume feared, but there can be no doubt that everywhere the Lesser Florican is less common now-a-days than it was when Hume wrote in 1879, thirty-two years ago.

Davidson, describing the way they are killed, writes, "Florican are found sparingly in Mysore, but I only saw one on two occasions in the Tumkur District, during last year. It is a migrant during the rains to Western Guzerat where it is remorselessly shot down while breeding, but apparently avoids the Panch Mahals almost entirely; at least only one specimen has been secured there during the last few years.

"They are ordinarily shot in the Deccan in the long grass bhirs, being flushed by a line of beaters, the guns walking along with the beaters. In the breeding season the cocks are sometimes shot in the following way:—In the early morning the gunner, *for one can hardly call him a sportsman*, goes to a bhir, where he knows there are birds, and waits till he sees one jump up in the grass



A. BEATER IN CUTCH WITH LESSER FLORICAN OR LIKH (*Sypheotis aurita*).



B. FEMALE LESSER FLORICAN ON NEST.

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and cry. He then stalks within 50 or 60 yards, and again waits till the bird jumps and then runs as fast as he can towards the spot. The bird generally rises 30 or 40 yards off, and there is a fair amount of excitement if not of sport, in shooting them in this way."

Capt. Butler gives a similar description as follows:—"For my part, I have always protested against the wholesale destruction of these fine birds in the breeding season, and tried very hard when I was in Deesa, to persuade sportsmen (!) to spare the hens. But it was of no use; they argued that, 'if they didn't shoot them, some one else would,' and consequently the Florican were shown no mercy.

"The usual method of shooting them is to walk them up in line, when they rise usually within easy shot. They are easily killed, and I have seen longer shots made at Florican than any other bird I know. In fact they drop if you fire at them at almost any possible distance (provided, of course, you hold the gun straight). At times, however, after being marked down, they are very difficult to find, as they commence running the moment they alight, and often get 200 or 300 yards away before you reach the spot where you have marked them down. But for this, scarcely a bird would escape."

Again, Mr. James says:—"The ordinary way in which a single gun pursues Florican is to walk through the grass, with a few beaters, listening for the cry of the bird and following it; in this way the bird can be tracked for a considerable distance. Before very long the bird will be seen jumping up above the long grass, as some think to pick grass hoppers off the stems. The best way then is to run as hard as possible up to the place when the bird will rise. They drop very easily to shot, but when once flushed are difficult to flush again."

All writers and sportsmen seem to concur in considering the Lesser Florican to be much less wild in its nature than any other Bustard and when in fairly high grass or crops they often lie very close, not rising until the line of beaters approaches within a few yards of them and seldom rising more than 30 yards in front of the line. Jerdon says that "it feeds chiefly in the morning and is then easily raised but during the heat of the day it lies very close and is often flushed with difficulty. I have known one instance of one being killed by a horse stepping on it."

On some occasions, however, even this bird lives up to the general reputation of its family for wariness. Jerdon himself admits that such a bird is sometimes met with and Hume says that in the cold weather when in short grass or young crops they are about the most difficult bird he knows to get near.

As might be expected the Likh is rather a favourite bird with Falconers; its habitat, its powers of flight and the ease and frequency with which it is found all combining towards this. Jerdon writes: "Its pursuit is consequently a favourite sport, and from the open nature of the ground it frequents, it is well adapted for being hawked. I have killed it occasionally with the Lugger, but generally with the *Shaheen*, and have already given an account of the manner of hunting it. Should the *Shaheen* miss her first stoop, I have seen the *Florikin* accelerate its speed so greatly, that the falcon was unable to come up with it again under 600 yards or so. I have seen one struck dead by the *Wokhab, Aquila vindhiana*. I had slipped a *Luggur* at it, which was in hot pursuit, though at some little distance behind, when two of these Eagles came down from a vast height, and joined in the chase. One of them made a headlong swoop at it, which the *Florikin* most skilfully avoided, only, however, to fall a victim to the talons of the other, which stooped almost immediately after its confederate, and dashed the poor bird lifeless to the ground. It had not, however, time to pick it up, for I rode up, and the Eagles soared off most unwillingly, and circled in the air long above me. The *Florikin* had its back laid open the whole length." (Jerdon's Ill. Ind. Orn. lc.)

It would seem a favourite prey of wild as well as tame falcons and eagles, for Hume also says that one of the very few specimens he obtained in the Etawah District was killed by a Bonellis Eagle after he had flushed it.

The flight of the *Sypheotis aurita* is much like that of other Bustards, but the wing strokes are rather quicker. Blanford says: "It flies well, with a quicker flight than other Bustards, having, when flying, a slight but peculiar resemblance to a duck." By "quicker flight" Blanford probably refers to a quicker wing movement and not actually to a faster flight, for the flight of the Likh is certainly not as fast as that of the bigger birds of this family.

When flushed it often flies a considerable distance and is then very hard to put up again, as it either squats close, allowing a line of beaters to pass over it, or it runs to a great distance and eventually rises far from where it was seen to alight. It is very strong on the leg and makes its way through thin grass or scrub jungle at an almost incredible rate, far faster than a sportsman can walk. Jerdon notes that "when walking or running it raises its tail, as is represented on the drawing, the lateral feather diverging downwards, whilst those of the centre are most elevated, as is seen in domestic fowls, etc., forming what Swainson calls an erect or compressed tail."

The voice of the Lesser Florican during the breeding season is said to be a harsh croak, this being indulged in by the bird during its nuptial flights. The voice of the hen at this time is described by Wenden as "a low clucking cry" but whether this differs from that of the male or not he does not say. According to Jerdon "it is said to have a feeble plaintive chirp or piping note when running or feeding" and he also says that when flushed it utters a kind of sharp quirk or note of alarm." A personal friend of mine, who has spent much time watching these birds, gives them credit for a rather large vocabulary. He remarks *in epistola*: "These Floricans have many notes besides the drum or croak they give vent to in the breeding season. When moving about feeding they constantly utter a low chuckle and also the chirp or piping note referred to by Jerdon. Males and females also call to one another in a croak like that just mentioned, but softer and lower."

The Lesser Florican not only suffers from the so-called sportsman who persistently shoots it throughout the breeding season, but they are also much persecuted by native snarers and bird catchers wherever and whenever they appear. Col. Fenton writes to me that he never came across these bird-catchers in Kathiawar, but that in the Deccan "the *phansi padees* or professional snarers never gave the birds any rest, and it is not surprising if they have diminished of late years." Mr. James records the same in Hume and Marshall in which work he is quoted as saying "*Pardis*, the professional poachers of the Deccan, snare them along with Partridges and Quail, simply by setting a rope of snares down the grassy bank of a dry nullah and then beating the bushes."

The principal food of the Likh consists of grasshoppers and in catching these, and other insects, it often hops into the air after them, catching them on the wing. No insect comes amiss to it and it will feed freely on Cantharides, beetles of all kinds, worms, centipedes and even, when hard pressed, small lizards, frogs, etc. It is also largely a vegetable feeder, eating both ripe grain and tender shoots of young crops and grasses as well as many kinds of berries and young herbs.

Its flesh is generally held to be excellent, though Hume says it is not as good as that of its larger first cousin, the Bengal Florican, and compares its flesh to that of the Blue Pigeon. The food it eats naturally affects its eating qualities and one sportsman may eat it at one season of the year and find it almost unpalatable, whilst another, a little later, may find it just the reverse. Jerdon thought that "its flesh is very delicate and of excellent flavour and it is the most esteemed of all the Game Birds." Mr. James writes, *vide* Hume, "It is perfectly true that sometimes the effects caused by eating Floricans' flesh after they have been feeding on blister-flies is most painful and disagreeable. I myself have suffered from this cause."

The breeding season of the Lesser Florican varies much in different localities. Jerdon says that some birds breed in Southern India from July to November and that he has put the hen bird off her nest in August in the Deccan and in October near Trichinopoly, and he also says that he has heard of hens being found sitting as late as January. Hume says that the majority breed in September and October and this agrees with the observations of most other observers in the more northern of their breeding haunts. As regards Kathiawar, however, it would seem that they commence rather earlier. Colonel L. L. Fenton writes me: "Only an occasional bird is to be seen at any other season of the year, but about the end of June they arrive in great numbers in the Kathiawar

Vids for the purpose of breeding. The large *Vids* round Rajkot, such as Kalipat, Kotaria, Ghanteshwar, Damalpur, etc., are celebrated for them at this season of the year, and I have here seen over twenty birds in one morning."

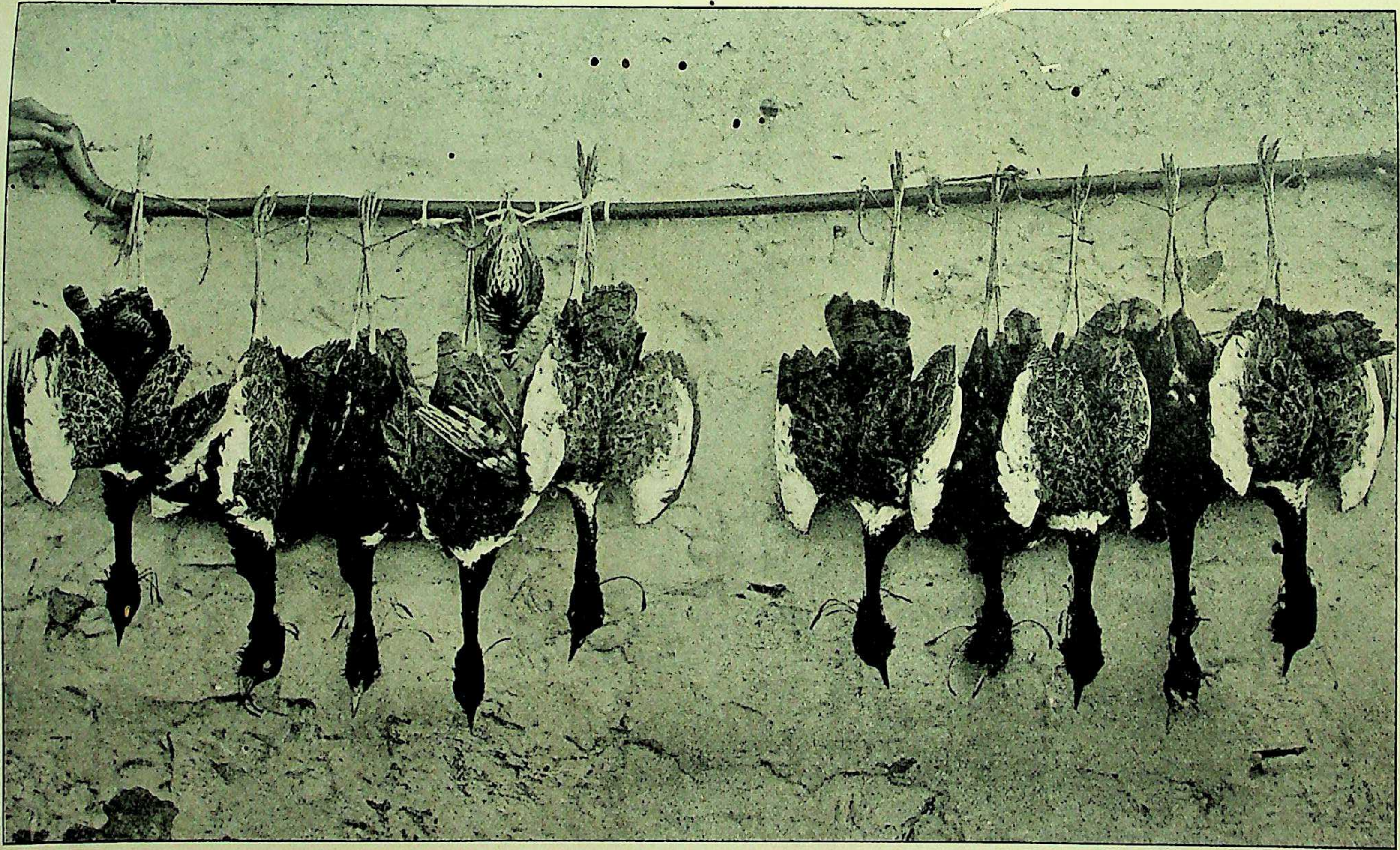
"There seems always to be a preponderence of cock-birds, but perhaps they are more in evidence than the hens, owing to their habit of jumping, and hens are, I think, at all times more difficult to flush than are the cocks. I cannot say where the greater number betake themselves after the breeding season is past, but it is an undoubted fact that very few remain in the Province, as they are rarely met with in the cold weather."

Allusion has already been made to the curious habit displayed by this bird of jumping into the air, to some height above the surrounding vegetables, in order to attract the notice of the opposite sex. Generally it is the male alone which resorts to this trick, but sometimes, at all events, the female also does indulge in it. Hume himself says that he has seen the female jumping, though he adds that this is only for the purpose of catching flies, etc., as they are disturbed from the grass. Mr. Wenden, however, whom Hume quotes, distinctly saw the female bird as well as the male jumping, and thus describes his experience—"On the 16th I went out and watched this bird for more than an hour, just about the time at which she had been flushed on the morning before from the single egg. From the tree on which I sat, with my binoculars, I saw her running rapidly out of the dense preserve, across the open and into the scanty patch in which was her egg. Here she moved about for some minutes feeding, and every now and then sprang into the air with a low clucking cry, which was answered by the male bird from the preserve, though at first I could not see him. Then as though a sudden thought had struck her, she darted to the nest, and after one or two springs, and walking round and round the egg, she squatted and deposited another. While she sat, she was quite silent, but the male bird, who had now advanced closer to me, kept springing in the air and crying continually. The operation of laying the egg seemed to last about twenty minutes—*i.e.*, from the time she sat to the time she rose and having made another spring or two walked round the eggs; she then made straight tracks for the dense grass where the male bird was calling.

"I went out quite alone on this watching expedition, and all was quite quiet, and the birds were at their ease; but while I was still in the tree, a man came into the preserve with some cattle, and then I saw both birds spring several times *silently*, and after that I saw or heard nothing of them."

Mr. Davidson also describes this quaint habit at some length; he says:—"The Florican breeds all round Sholapur, in considerable numbers, wherever there are grass preserves with long grass. During the breeding season they seem chiefly to haunt the thinnest patches of long grass rather than those full of small bushes; they are at this period exceedingly difficult to flush, particularly the hens, which, even if you succeed in forcing them to rise, get up only at your feet and make but very short flights. The cocks are not quite so difficult to flush, but you are obliged to run towards them, to get even *them* up: if you simply walk after them they will rarely rise. Their whereabouts are, however, generally easily discovered by their frog-like call, and their occasional sudden jumps up into the air. They do not seem to call much when the sun is bright, but chiefly in the morning and during cloudy days. I have often watched them flying or jumping up, but I am still uncertain why they do it. My original impression was that they sprung up to seize insects from the grass stalks, but I have long abandoned this idea, as they rise much above the grass. Moreover, I have only seen one bird thus rise that could have been a female and this was dark-coloured, and probably a male that had not assumed breeding plumage, and I am inclined to consider these sudden flights as simply one of those bridal displays so common in the males, especially of gallinaceous birds, such as the flapping of the wings in Pheasants, the nautch of the Peacock, the lek of the Capercailzie, and the pouch-inflated strut of the big Bustard, and if it can be certainly established that this habit is confined to the males no alternative solution seems open to us."

The Lesser Florican is unlike most of its family "in India at all events" in that it is monogamous, whereas the others are either polygamous or "promiscuous" and the male is said to remain with,



A BAG OF LESSER FLORICAN OR LIKH (*Sypheotis aurita*).

or near, the hen even after incubation has begun. Although this seems to be a generally accepted fact, there are a good many points which would seem to be against it. In the first place male birds which display *continually* throughout the breeding season seldom keep to one wife for the whole period, nor as a rule are monogamous males as pugnacious as are polygamous birds. Jerdon's description of the display and pugnacity of the Likh certainly look like attributes of a polygamous male. He writes: "The full and perfect breeding plumage is generally completed during July and August. At this season the male bird generally takes up a position on some rising ground, from which it wanders but little, for many days even; and during the mornings especially, but in cloudy weather at all times of the day every now and then rises a few feet perpendicularly into the air, uttering at the same time a peculiar low croaking call, more like that of a frog or cricket than that of a bird, and then drops down again. This is probably intended to attract the females, who before their eggs are laid, wander greatly; or perhaps to summon a rival cock, for I have seen two in such desperate fight as to allow me to approach within thirty yards before they ceased their battle."

The Bengal Floricans, males and females, undoubtedly do *not* pair at all, and the male is neither polygamous or monogamous, yet its courting displays are identical with those of the Lesser Florican as is the habit of the male of displaying in one particular spot whilst the females wander about the country. It is probable, therefore, that when we come to know the domestic habit of *Sypheotis aurita* more intimately they will prove to be similar to those of *Sypheotis bengalensis*.

The Lesser Florican makes no nest in which to deposit her eggs, nor does she, as a rule, even trouble to find or make a hollow for this purpose merely depositing them on the ground in some small bare patch in a field of grass. The grass field selected is seldom one of any very great size or having dense growth in it and the bird seems to prefer small pieces of grass of some two feet or so high and of scanty growth. The bird watched by Mr. Wenden deposited its eggs "on the bare ground, which was perfectly level (without the least signs of scratching) in some thin scanty grass, about 2 feet high and about 2 yards in from the edge of the grass patch. Not a hundred yards from the plot of grass in which the eggs were deposited was a preserve, over a mile long by a quarter broad, of very high dense grass, a far more likely place, one would have thought, for so wary a bird to lay its eggs."

When the bird does lay its eggs in a vast stretch of grass, as is sometimes the case in Kathiawar, it is said almost invariably to choose some part where the grass is shorter and more scanty than elsewhere and also often to make use of some bare spot close to the outskirts of the field.

The nest, found by Mr. Wenden, contained three eggs, one found in it on the 15th, one laid on the 16th and the third on the 18th; this corresponds with what we should expect and with what I have heard from other observers and it seems, therefore, fairly certain that the species lays its eggs on alternate days.

As a rule the full clutch of eggs consists of four, but often only three are laid, sometimes but two and very rarely five. I have never seen a clutch with five eggs myself, but Lieut. F. Alexander recorded that this number was sometimes laid and Mr. James once found five chicks together.

In shape the eggs are typically very broad ovals, more spherical than those of any of the other Bustards; but for this they are hardly distinguishable from those of the Lesser Bustard, *Otis tetrax*, though on an average they seem considerably smaller. For instance the average size of the 26 eggs of the Likh in the British Museum collection is 1·82″ × 1·6″ (=about 46 × 40·6mm.) whereas the 23 eggs of *Otis tetrax* measure 2·07″ × 1·51″ (=about 52·6 × 38·2), these figures shewing well the difference in comparative shape and size in the eggs of the two species.

Hume gives the average of twenty-three eggs as 1·88″ nearly by rather more than 1·59″ (=48 × 40·5mm.) and the average of 18 eggs which have passed through my hands and are not included in any of the above is 1·84″ × 1·6″ (=46·8 × 40·3).

The surface of the shell is very smooth, though pitted with tiny pores, and there is always considerable gloss, very highly developed in many cases. The texture is fine and very close.

Hume thus describes his series of eggs now in the British

Museum. "The eggs like those of the Great Bustard (which, though smaller, they greatly resemble), vary much in size, shape and colouration.

"Typically they are very broad ovals, with a feeble tendency to a point at one end; but some are nearly sypherical, some are purely oval, while one or two approach a Plover shape.

"The shell, everywhere closely pitted with miniature pores, is stout but smooth, and has always a slight, and at times a brilliant gloss.

"The ground colour varies from a clear, almost sap green, through various shades of olive green, drab and stone colours, to a darkish olive brown. I have seen no specimens exhibiting the blue and bluish grounds occasionally met with in the eggs of the Great Indian Bustard."

"The markings are brown, reddish or olive brown, occasionally with a purplish tinge, in some very faint and feeble, obsolete, or nearly so, a mere mottling, in others conspicuous and strongly marked; but in the majority neither very faint nor very conspicuous. In character they are generally cloudy streaks, more or less confluent at the broader end (from which they run down parallel to the major axis) and more or less obsolete towards the smaller end. Occasionally, however, they are pretty uniformly scattered over the whole surface of the egg."

"In size the eggs vary from 1·77 to 2·06 in length, and from 1·5 to 1·7 in breadth; but the average of twenty-three eggs is 1·88 nearly, by rather more than 1·59."

The eggs in my own collection agree well with the above but there is one pair which deserves separate description. These have the ground colour a most beautiful green grey, very pale and almost silver in tone. The markings are as described by Hume but are unusually bold and stand out conspicuously on the pale ground, making them both very handsome.

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* The two photographic plates in this Number and the one of the Houbara at page 330 in the last Journal, are from photographs taken by H. H. the Rao of Cutch, a sportsman with an intimate acquaintance with these birds and their habits and one who has supplied me with many interesting details regarding them.

(*To be continued.*)

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XI.

(*Continued from page 544 of this Volume.*)

FAMILY—PAPILIONIDÆ—(*continued*).

89. Papilio crino, *Fabr.*—Like *P. buddha* but with the green discal band much narrower, especially on the forewing, the male has, generally, woolly scent-streaks on outer portions of veins 2 to 4 of forewing. Forewing in male and female with the transverse, discal band bluish-green, slightly sinuous, curved, narrow, increasing in width from costa to dorsal margin; more sinuous in the female. Hindwing with the band variable in width, but much broader than on forewing, continued above vein 7 to costa but much narrowed abruptly in that interspace; tornal ocellus claret-red with a large black centre inwardly edged with blue; a sub-apical whitish spot; subterminal diffuse, green lunules in interspaces 2, 3, 4; the spatular apex of tail with a patch of bluish-green scales. The whole upperside is irrorated on both wings with brilliant green scales but much less densely than on the basal area of the wings of *P. buddha*. *Underside* dull pale brown to blackish brown, irrorated with scattered, yellowish scales which, however, on the forewing are absent from a large, triangular, discal patch that lies between the dorsum, the median vein, vein 5 and a line of white lunules that crosses the wing in an outward curve from the upper third of the costa to just before the tornus; these white lunules are outwardly diffuse and merge gradually into the brown ground-colour. Hindwing: the tornal ocellus much as on the upperside; an obscure, ill-defined, highly arched, postdiscal, narrow, whitish band from above the tornal ocellus to the costa ending near apex of interspace 7 in a broad, white lunule; beyond this a double sub-terminal row of somewhat straight, ochreous-white lunules in the interspaces, each lunule of the inner row bordered outwardly with blue, this bordering very faint in some specimens. Cilia of both fore and hind wings brown alternated with white. Antennæ, head, thorax and abdomen dark brownish black; the head, thorax and abdomen above with a sprinkling of glittering green scales. Expanse 100-116 mm.

V. 21/3
590.5
B63J
48,960

Larva.—"Somewhat limaciform; anterior segments convexly scutellated; furnished with a pair of short, fleshy tubercles on anterior and two on anal segments." (*Moore.*) "Colour bluish-green." (*Dr. K. Jordan.*)

Pupa.—"Curved backward anteriorly; head broad in front; green." (*Moore.*) From these descriptions of the larva and pupa may be gathered that they are very similar to those of *P. buddha*.

Habits.—There does not seem to be any record of the habits of the larva, but it is not probable that it differs as regards its ways from that of *P. buddha*. The imago is also not likely to differ from that species as to choice of the style of country it inhabits though it does not seem to be found below 2,000 feet above sea level. It has a peculiar distribution but it is difficult to say to what this may be due. It exists in Lower Bengal, in the Central Provinces, South India and Ceylon. It has not been found anywhere in the Bombay Presidency up to date but occurs in the Nilgiris. It is said to be "rather common in the Plains, especially in the Spring, in Ceylon, but also occurs in the mountains up to about 6,000′. The flight is very swift." (*Dr. K. Jordan.*) The foodplant is given as "Chloroxylon" by Dr. Jordan. It is fairly certain to be *Chloroxylon Swietenia*, DC., a member of the family of the *Meliaceæ* to which the Neem belongs; it is known as the Indian Satinwood tree and grows to a large size in Ceylon which is probably the place Dr. Jordan's information was obtained. This foodplant gives an indication of the sort of habitat the insect affects. The tree is found in dry, hot parts of the Bombay Presidency such as Bijapur, Dharwar and the east of Belgaum though the butterfly has never been, as stated above, yet noticed in any of these places. In Ceylon also it is limited to the dry regions. Its distribution is said to be the deciduous forests of the Western Peninsula as far as the northern edge of the Satpura mountains running between the Narbaddha and the Tapti rivers; but it is more than probable that it occurs further north-east, extending through Chutia Nagpur into the Behar Hills and, possibly, still further north up to the Ganges, on the Rajmehal Hills; and this simply because *Papilio crino* is found in Lower Bengal; that is the occurrence of the butterfly there is certain to indicate the existence of the foodplant of its larva. This is not the only interesting botanical inference which may be drawn from the entomological fact.

Besides the question of distribution there is also a question of the affinities of the foodplant, *Chloroxylon*. It has been stated that the larvæ of the genus *Papilio* in India or, to narrow the question down further, of the genus as composed of the groups of *Papilio* mentioned in these papers more particularly, feed upon plants belonging to certain well-defined botanical families, each group being absolutely limited to one family in particular. These families are *Anonaceæ*, *Rutaceæ*, *Aristolochiaceæ*, *Lauraceæ*, all with aromotic leaves which make it easy enough as a rule to place them where they botanically belong. The Satin-wood is generally placed by botanists in another family, the *Meliaceæ* where, evidently, the butterfly thinks it should not be. It has been mentioned before, also, that *Papilio demoleus* larva was once found on this plant in the Bijapur District of the Bombay Presidency; causing, at the time, considerable surprise as the foodplants of that larva were, as evinced by thousands bred in different localities at all times of the year, all rutaceous. This led later to enquiry into the affinities of the plant which, probably owing to ignorance, ended in no definite result until the following statement presented itself in Brandis' "*Indian Trees*", *viz.*: "Engler in Engler u. Prantl iii. 4, 171 places *Chloroxylon* under *Rutaceæ* chiefly on account of the translucent glands in the leaves, which form one of the distinguishing characters of that order." From which, backed up by a careful comparison of the descriptions of *Chloroxylon* with some of the genera of *Rutaceæ*, the probabilities are that *Papilio crino* knows more about real affinities in plants than botanists—except Engler.

There are butterflies of the same sort as *buddha* and *crino* in Burma and the Malayan Region. *P. palinurus*, F. from Burma, Malay Peninsula, Sumatra, Borneo and Banguey Island is like the former but has the band on the hind wing narrower and is generally smaller; it has subspecies in Palawan (*angustatus*, Staud.) and in the Phillipine Islands (*dædalus*, Feld.); *P. blumei*, Boisd. is a fine species inhabiting Celebes, with rather broad blue-green bands to both wings and blue-green tails. The green of our two species shows peacock-blue in certain lights, violet in others; when flying in the sun it appears always very brilliant metallic green.

90. Papilio buddha, *Westwood.*—Male *upperside*: black, closely irrorated with brilliant green scales, the basal area up to the discal green band much more closely than elsewhere. Forewing with a very slightly excurved, oblique, bright green discal band that extends from the middle of the costa to the dorsum well before the tornal angle; measured on the dorsum the width of this band is more than one-third the length of the dorsal margin; anteriorly it passes through the apical third of the cell and is narrowed slightly at the costa; the irroration of green scales beyond this band is much thinner than at base of wing and is confined to a triangular patch from apex of wing downwards along terminal margin. Hindwing with the median third beyond the basal irroration occupied by an outwardly curved, brilliant green patch interrupted by vein 6, in continuation of the band of forewing, reaching the dorsal margin and slightly narrowed at both ends (sometimes it is slightly produced into interspace 7), its outer margin diffuse; this is followed by a subterminal series of ill-formed green lunules traversing the outer black area which is, including the tails, otherwise devoid of green scales. The costal area beyond vein 6 is dark brown with a subapical bright ochraceous lunule. Finally there is a tornal ochraceous ocellus centred largely with black. Cilia of hindwing brown, alternated with ochraceous. *Underside* softly brown-black.; bases of both fore and hind wings somewhat thickly, the outer portions more thinly, sprinkled with pale yellow scales. Forewing: apical half obliquely pale brownish white, darkening to dusky blackish at apex and narrowly along termen; the pale area narrow at termen, gradually broadened up to the costa, traversed by the black veins. Hindwing: uniform: an outer pale terminal band traversed by a subterminal series of ochraceous lunules bordered on both inner and outer sides by velvety black (hardly at all on the inner sides), the inner side further bordered conspicuously by silvery white; the lunule in interspace 7 much larger and bolder. Antennæ, head, thorax and abdomen velvety black, the head and thorax above irrorated with green scales. Female differs from the male in having the tails broader and, generally, in having the subapical ocellus of the hind wing larger. Expanse 92-102 mm; sometimes larger. The male about equal to the female.

Egg.—The egg, laid generally on the top of a leaf, is light lemon in colour at first, but soon gets a broad rusty band round the centre with a darker, irregular, rusty line in middle of band, the summit of egg with a rusty (colour of darker line) large patch. In shape it is spherical: the surface is slightly shiny and obscurely frosted-rough. Diameter 1. 3mm: very small for the butterfly.

Larva (*1st stage*).—The head is round covered with short, black hairs and is coloured translucent very light buff, slightly darker on each side near the apex of clypeus; eyes black; clypeus large. The shape of the larva is the same as that of the larva of *Pap. polymnestor*, &c., at the same stage. Dorso-lateral tubercles of segments 2 and 13 are long, conical, fleshy; dorso-laterals of segments 3, 4, 5 and 12 are about half the size and exactly similar; those of segments 6 to 10 are half as small again as those last mentioned and rather cylindrical; there are no sub-dorsal tubercles except one at the base of the dorso-lateral of segment 2; supra-spiracular tubercle of segments 3 and 4 as large as dorso-lateral of same segment and similar to it, those of segment 4 possibly the larger slightly; spiracular tubercles disposed as usual, very minute with 2 or 3 black spines. Surface dull. Colour a livid greenish-yellow with a very dark olive-green dorsal band from segment 3 to 11, covering the whole dorsum of segments 3, 4 and 5, becoming a mere line on the last segments; a broad lateral band of same colour from segment 5 to 12 with a thin line of the body colour running down the middle; belly and base of legs dirty greenish; segments 2 and 13 with the tubercles light greenish-ochreous: all the tubercles shiny translucent and all the spines on them (with the exception of the spiracular spines of which are black) are yellow. L: about 4·5 mm. with tubercles; B: 1. 25 mm. without tubercles and 2·25mm. with at broadest part which is segment 4.

2nd stage.—Is very similar to the same stage of *P. tamilana*; the sub-dorsal tubercular spots only exist near the front margin of segt. 5: on no other segment; the subdorsal, small, fleshy, spined tubercles at base of laterodorsal tubercles of segment 2 still exist; the laterodorsal fleshy, conical tubercles exist on front margin of segment 2, hind margin of segment 13, in centre of segments 3, 4, 5 and 12 though these central tubercles are much shorter than the marginal ones of segments 2 and 13; the dorsolateral tubercles of segments 6 to 11 are very small, central, spined like all the rest; the supraspiracular tubercle of segment 4 is little smaller than the dorsolateral tubercle of segment 2 and the supraspiracular tubercle of segment 3 is in size between these last two; the supraspiracular of segment 2 is nearly the same size as that of segment 3; the supraspiracular tubercles of segments 5 to 12 and the other spiracular tubercles of all segments are mere spots with one or two hairs on them. The head is yellowish and is covered with minute erect sharp hairs which are black but not densely; the head is suffused with brown on upper part of the clypeus; which is of ordinary size, triangular, and along the margins bounding the clypeus; is roundish, very slightly bilobed, shiny. The surface of larva is shiny and covered sparsely with minute black hairs on segments 2 to 5. Colour of larva is rather dull olive green, the spiracular region greyish, a lateral greyish line; a rather broad subdorsal whitish region on segments 6 to 11; segment 5 marked yellowish in its hinder half, this marking being continued along the lateral region of segments 4 to 2 as far as head; there is a dark spot or patch just below lateral greyish line on segments

6, 7 and 8; base of large tubercles of segment 13 strongly ochreous, the base of those of segment 2 less so, the rest transparent greenish; all the spines of tubercles whitish. L: 10mm; B: 3mm. at segment 4 without and 4mm. with tubercles.

3rd stage.—The larva has lost the dorsolateral tubercles of segments 6 to 11 completely, but has those of segments 2, 3, 4, 11, 12 still, those of segments 2, 11 and 12 as large as ever, those of segments 3, 4 mere knobs; the supraspiracular segments of segments 3 and 4 are still there, the former about half the size of the latter and the latter smaller than dorsolaterals of segment 2. All signs of supraspiracular and spiracular tubercles completely gone. Head is greenish and covered with extremely minute hairs. Surface of body is only slightly shiny. Colour is dark green with an irregular spiracular white line, a white band along base of legs, the space between marked whitish, the tubercles ochreous, a yellow line joining bases of supraspiracular tubercles of segments 4, 3 to base of dorsolateral tubercle of segment 2, and a maculate light yellow broad band from base of supraspiracular tubercle of segment 4 on one side runs back and along hinder margin of segment 5 over dorsum to supraspiracular tubercle of segment 4 on the other side; a yellowish small patch on the common margins of segments 6/7, 7/8, 10/11 dorsolaterally with the margin thinly yellow between over dorsum; some indistinct yellowish spots all over. L: 15mm. at rest by B: 5mm. at segment 4 and 5mm. with tubercles.

5th or last stage. (Pl. 1, Fig. 15).—The larva in shape and general appearance is very like that of *P. tamilana.* The head is light green, the eyes black; and is of the usual shape. Segments 2 has the front margin straight with a small tubercle at each end of it; the dorsolateral tubercle of segments 12 and 13 also remain, those on the former minute, on the latter as large as those of segment 2. Spiracles rather small, coloured like the body with linear whitish centres. Surface smooth and dull. The colour of the larva is dark green, spotted finely with light yellow: a subspiracular yellow band from segment 6 to segment 12; a distinct subdorsal row of tubercle-like yellow spots on segments 7-12; a transverse row of yellow spots near front margin of segment 4 ending on each side in an indistinct ocellus or eye which, however, may occasionally be distinct and black—this row of spots representing the front crest of the *P. tamilana* caterpillar; on segment 5 is another transverse crest near hinder margin with a thick spotting of light yellow continued under the ocellus forwards by a narrow yellow band or line up to the base of the tubercle on front margin of segment 2. The space enclosed between the two crests and this band or line is oval in shape, longer than broad and is often called the "shield"; it is somewhat flattened and often greyish looking ventrum, anal flap and legs watery greenish white. L: 46mm; B: 10mm. at the broadest part which is segment 5.

Pupa (Pl. 1, Fig. 15 a.)—Is very like that of *P. tamilana* in shape and colour; except that, as regards the shape, the dorsal line is much straighter, the front part formed by segments 1-5 not being thrown back at such an angle as in that species ; the thorax is slightly less humped, the headpoints are longer: nearly as long as they are in the pupa of *Papilio pamon*. There is a very slight carination in the dorsal line from segment 2 to cremaster. Spiracles small, oval-linear, the same colour as the body of pupa. Surface dull and more or less smooth. Cremaster strong and square at end. Colour dark green ventrally much lighter dorsally to approximate to the upper and underside of the leaf of the plant it feeds on; dorsal line, dorsoventral line from cremaster to shoulders and ventral suture-line of wings, all yellow ; there is a subdorsal jet-black spot on segments 6. L: 32 mm ; L: 10 mm. at middle.

Habits.—The egg is laid on young shoots, or on the top of an old leaf in the monsoon months. The larvæ prefer leaves that are not too young as food ; they lie in the centre of the upperside of leaves on a bed of silk, separately of course: that is, never more than one on any one leaf ; and the yellow speckling of their skins makes it difficult to see them as the leaves of the foodplant are very similarly marked with spots produced by the agency of some insect. The pupa is almost invariably formed on the foodplant, hanging from, and attached to, a twig or twig and leaf—midrib with a moderately long body-band and strong tail fixing ; thus hanging with the light coloured back showing to an observer on the ground among the light green leaf-undersides while the dark ventral green, directed upwards, harmonises with the dark green of the uppersides of the leaves to aid in protecting it against detection from above. The osmeteria are reddish in colour but the larva does not often make use of them, that is, it rarely protrudes these scent-organs. The imago is not really a butterfly of the Plains as distinguished from the Hills, though it is perhaps fonder of open scrubby jungle and continuous sun-shine than most other swallowtails. Its habitat is given as Southern India and it seems to be confined to the western coast where it is perhaps commonest in the low hills along the sea, board wherever its foodplant is found ; it certainly ranges from sea level up to 2,000 feet. Its range is most probably determined by heavy rainfall. As indicated above, this beautiful butterfly rejoices in the hottest sunshine and in the Kanara District, where it is very fairly plentiful, it offers one of the most inspiring sights to the active lepidopterist. It is a fast flier and nearly always keeps to the tops of the trees round which it circles in rapid activity. It is consequently difficult to catch; a long net and a quick eye are absolutely necessary to effect a capture. Even then it is nearly impossible without a careful choice of a place of vantage. The best way is to choose a Tirphal tree (the vernacular name of the foodplant in Mahratti) round which the butterflies circulate, with a rock or high place near it and wait until an insect flies within reach; or, better still, choose two trees on a hill side or on uneven ground, one of which is higher than the other and stand between them. The glint of the blazing green of the wings as the insects pass below the level of the eye will generally ensure an amount of perseverance in the chase that should result in ultimate success. Captures are always found to be males, and the reason is difficult to guess, except it were a fact that more of that sex were born than females. This, however, is not the case as has been proved by breeding from the egg and caterpillar. Indeed breeding results in more females than males. Females lay but one egg at a time, and do not take long about it; they fly as fast and as swiftly as males; but no one can say whether they keep it up as long: perhaps they do not, and rest for long periods at a time, but even this would not explain why so few are caught in the net, for there must be thousands and thousands of individuals in any one locality. Female *buddha*, unlike the females of other insects which are also rarely met with and which keep so it is said to the underwood and tree tops in dense jungle, frequents open ground as often as the males and so ought to be visible as often as these. She must fly at a different time to the male; it is the only explanation; and that time cannot be the hottest hours of the day. So little is known about such matters! The larva feeds upon *Zanthoxylum Rhetsa*, DC., mentioned before as one of the foodplants of *Papilio helenus* and has not been found upon anything else. *Zanthoxylum* is a genus of the *Rutaceæ*.

The caterpillar of this most taking insect was first discovered by the late E. H. Aitken, that most genial of men and pleasantest of companions, in the year 1894 in the vicinity of Karwar on the sea-coast of North Kanara District. He formed one of a combination of three naturalists, who found themselves thrown together in the early '90s in that beautiful spot, and forthwith proceeded to work out the life histories of all the butterflies of the surrounding country. Nearly all the observations upon which these papers are based were carried out there; a large number in those early days of the brotherhood of three, later by two and then, finally, when inexorable circumstances led to mutually regretted separation, by the remaining one. But the early days were the best days for everything was new, and there was unlimited material to work at. Every day brought forth something of interest; every expedition was crowned with abundant success. The larva of *buddha* was much sought after at that time, but had eluded discovery for many months of patient search. The food-plant was known; or, at least, it was taken for granted that it must be Tirphal, for the butterfly was noticed constantly flying round such trees. At last E.H.A. (for those who may not remember him by the initials, it will only be necessary to mention that he was the author of "Behind the Bungalow", "Tribes on my Frontier" and other good books), found a little caterpillar upon a Tirphal leaf and took it home without saying anything about it. He was very excited and hugged the secret from midday until dark that day; but then he could bear the strain no longer and gave it away. There was great rejoicing among the three and every morning, for several weeks after, very tender inquiries were made about its health and progress in growth, or it was inspected with expectant interest. Then one morning it was reported ailing and anxiety was great. Next morning it was dead. That was a day of gloom; but the depression resulted in a firm resolve to seek for more caterpillars and the consequence was that in less than a week, there were half a dozen of all sizes in the breeding cages. The rest was easy.

91. **Papilio antiphates,** *Cram.*—Male and female *upperside*: white. Forewing: cell crossed by five short bands of which the basal extends to the dorsum, the subbasal into intersapce 1, the medial and pre-apical up to the median vein and the apical or fifth along the discocellulars; this last extends broadly on both sides of the veinlets and terminates at the lower apex of the cell; beyond these are broad, postdiscal and terminal, black,

transverse bands from costa to tornal angle; the two bands coalesce below vein 4 and terminate in a point at the tornus; the white portions of the cell anteriorly overlaid with pale green; short, macular, hyaline green bands between the black, cellular, apical band and the discal band and anteriorly between the latter and the terminal band. Hindwing: basal three-fourths uniform white with black markings on the underside that show through by transparency; terminal fourth dark grey traversed by a curved, irregular, subterminal series of black lunules that ends in a black tornal spot and a terminal, black band that follows the indentations of the wing; the emarginations below the black, terminal spot edged with ochraceous; the tail blackish grey, edged and tipped with white. *Underside*: forewing similar with similar markings, but the green shading over the white portions in the base of the cell more decided; the discal and terminal, black bands separate, not joined posteriorly, the former edged posteriorly on both sides with dark grey, due to the black on the upperside that shows through by transparency. Hindwing: basal half green, the outer half white; a large black, tornal spot; a black line along the dorsum that curves above the tornal spot outwards to vein 2; a straight, subbasal black band from costa across cell that terminates at vein 2, joining the dorsal black band; a broader, black band from costa across apex of cell extended into base of interspace 3; an irregular, discal series of black markings curved inwards posteriorly towards the tornal spot; a subterminal series of very small, slender, black lunules in pairs (variable in size and distinctness), the ground-colour on the inner side of these darkened to rich ochreous yellow; lastly, a series of short, terminal, black bars in the interspaces so arranged as to follow the indentations of the termen; tail dusky black, edged with white. Antennæ black; head and thorax anteriorly with broad, black, median band, rest of thorax bluish; abdomen white marked beneath on each side by a black stripe.—Expanse 90-104mm.

Larva.—The caterpillar of this species is very like that of *P. nomius* in general facies, especially when young. The head is rather round in shape, drawn under segment 2 in repose; it is green in colour. Segment 2 is little broader than the head and is slightly convex, trapezoidal in contour, with a thin ledge along the front margin. Segments 2, 3 and 4 taken together are truncated—triangular in shape, very slightly convex transversely, the base of the triangle being the hinder margin of segment 4, the truncated apex being the front margin of segment 2: the lateral sides of these segments are nearly perpendicular to the ventral surface, even slightly sloping in towards the legs. The hinder margin of segment 4 is the broadest and highest part of the larva, whence the body gradually decreases in diameter to the cremaster which is somewhat long and narrow, running out at each corner of the truncated end into parallel, rather long, sharp points, one to each corner, separated by a straight line between their bases. The dorsal half of segments 5-14 is very convex transversely, the sides nearly perpendicular to the ventral surface. Segment 13 is short though quite apparent. Segments 3 and 4 have each a short, sharp, conical, lateromarginal tubercle situated in the centre; segment 2 has a small one at each end of the front margin. Spiracles are oval, black, with a white central slit to each. The surface of the body is covered with hardly perceptible semi-appressed, white hairs; the legs and two end-points are set with somewhat longer erect ones which are brown on the latter and white on the legs; the surface is otherwise smooth and is dull; the segment slightly constricted at margins. The colour of the larva is a darkish transparent looking olive-green speckled thinly with white on the dorsa of segments 5-14, the specklings being arranged so as to form a white dorsal line and a dorsolateral darkish line, a dark diagonal stripe on segments 5-11 running across from one segment to the next succeeding from the centre of the dorsoventral margin of one to the darkish dorsolateral line of the succeeding one; there is a broad, spiracular, white-yellow band, below which there is a deep green subspiracular one followed by a whitish band bordered below by a green one; the legs are watery green; the dorsum of segment 2 is yellowish white with a dorsal green line; the flattened deep green dorsa of segments 3 and 4 are surrounded completely anteriorly, laterally and posteriorly by a yellow-white band and the lateral parts of these segments are suffused with reddish black; tubercles on segments 2, 3, 4 are black. L: 40mm.; B: 9mm. at the broadest part at segment 4.

Pupa.—The pupa on the whole is of the type of that of *I. nomius* though of course there are considerable differences in colour, shape and method of suspension. The head is quadrate seen from above, triangular from the side; eyes only slightly prominent; frons at an angle of 60° to longitudinal axis of pupa; from head the lateral outlines diverge to shoulders, are then parallel as far as segment 4, after which the wings are expanded in a considerable curve rather suddenly, merging gradually further on into the surface of the abdomen about front margin of segment 8; ventrally the wings are only slightly convex along the ventral line: it is very nearly parallel to the dorsal line; the ventral line of abdomen beyond is slightly convex also converging gradually towards the dorsal line towards cremaster; this dorsal line straight from cremaster to the apex of thorax, sloping gradually away from the longitudinal axis of pupa at an angle of about 25° to run out at thorax-apex into a short, blunt point directed forwards at an angle of 45° with that axis; the cremaster is strong, parallel-sided, rather long, lying more or less along the surface of attachment. The surface of pupa is dull and has the following low ridges on it: one circumscribing the frons of head, one along dorsal line of frons and segment 2, produced on to segment 3 as far as the thoracic blunt point, a slight ridge from head to shoulder-point laterally, another, in continuation, thence to where wings commence to expand and along the expansion-edge, continued along sides of abdomen as far as cremaster; the head-front is flat, segment 2 slightly convex, the abdomen dorsally above the carinæ also flattened on segments 4-8. The spiracles are longly oval in shape and light in colour and are of ordinary size. The colour of the pupa is bright green, with a dorsolateral line on segments 4 to 8 where it merges into the lateral ledge-line of abdomen, yellow; the base of thoracic process or point and this point, the head-ridge and those from it to shoulders with those thence to wing-expansion edges, brown; carinæ of segments 1, 2, 3 broadly flanked with brown, narrowing on front margin of segment 2; segment 2 with a brown linear mark laterally; ventral central line yellow. L: 30mm.: B: at broadest part 10mm.; thoracic point 1mm. long.

Habits.—The egg is laid single on the upperside of a fresh leaf or shoot and is of the ordinary spherical shape, greenish white in colour when first deposited, hardly shiny. The little larva takes to the midrib at once, but nearly always wanders to feed on the edges of other leaves than that upon which it has chosen to make its bed of silk and take up its abode. As it grows it occasionally changes its seat, making a new one, and, finally, when full grown, like most other *Papilio* larvæ, it will occasionally quit the leaf and take to stems and twigs. In the last stage it keeps to shady, well hiden leaves and never lies out in the sun. The larva is sluggish and walks with a halting motion. It pupates against a twig or stem of a plant, under a leaf also, as occasion serves and the body string of the chrysalis is very long. The caterpillar is like that of *P. nomius*, the pupa is of the same type also but differs from that of that insect in some essential points, and is never formed anywhere but in positions above specified; it is always green in colour. The butterfly is a quick flier, not powerful but very graceful, stronger than *P. nomius*, and rises much higher towards the tops of the trees round which it may be seen circling on sunshiny days in the evergreen jungles of Kanara on the Western Ghats. It is most plentiful there in the monsoon months and immediately before and after, while the young shoots of the foodplant are still being put forth. It is a local species, keeping to the moister evergreen forests from sea level upwards and is nowhere excessively common. It comes to flowers like *P. nomius* and, in company with that species, members of the genera *Appias*, *Prioneris*, *Catopsilia*, and *P. sarpedon*, *P. eyrypylus jason* and, occasionally, *P. dravidarum*, may be seen drinking on patches of damp sand in the beds of nallas and rivers or, after a shower of rain, on the wet mud of roads in the hot, close days that immediately precede the south-west monsoon. It then rests with the wings closed over the back though it exposes them, horizontally outstretched, in the ordinary *Papilio* style, when resting from flight on a leaf. The foodplant of the caterpillar is *Unona Lawii*, Hooker, and it has never been found upon anything else, although there are other *Unonæ* where it has been collected. *Unona* is belonging to the *Anonaceæ* and *Lawii* is an extensive climbing shrub common in the evergreen forests of Kanara. There are sub-species of this butterfly existing throughout Ceylon, India, Burma and the Malayan Region of which *P. antiphates alcibiades* is the commonest. Typical *P. antiphates* is said by Rothschild to come from Western China and Hainan but Bingham gives it as recorded also from Travancore. It is the butterfly of North Kanara also, where *alcibiades* does not occur. This insect will not be found in the Plains. *P. epaminondas*, Oberthür, with discal black markings on the upperside of the hindwing, comes from the Andamans. *P. androcles*, Boisd., and *P. dorcus*, De Haan, are two very fine species from Celebes.

92. Papilio nomius, *Esper.*—Male and female *upperside*: bluish-white. Forewing: the cell with five broad, transverse, black bands, the basal and subbasal bands produced to the dorsum, the medial band generally extended into interspace, the pre-apical ended on the median vein and the fifth or apical from costa along discocellulars extends on both sides of these and ends at lower apex of cell; beyond the fifth band is a short, transverse, macular band of the ground-colour that terminates on vein 5, followed by a very broad, black, terminal band that occupies about one-third of the width of the wing and is traversed by a transverse, subterminal series of rounded white spots. Hindwing: ground-colour along dorsum and above vein 7 whitish; a streak along the dorsum, a subbasal and an inner, discal, transverse band from costa across cell (sometimes interrupted in the middle), and a very broad, terminal band, black; the former two joined near the tornus by cross, lunular, black marks, the terminal band traversed by a series of slender white lunules; a black spot in interspace 1 above the tornus and another small one at base of interspace 4; the black at the apices of interspaces 2-4 and the lunules of the ground-colour thereon suffused with grey; tail black, edged and tipped with white. *Underside*: white, the black markings very similar but of a bronze-brown with the following exceptions:—Forewing: extensions below the median vein of the basal, subbasal and median transverse bands crossing the cell, and the inner portion below the vein 4 of the terminal, broad band, black. Hind wing: the inner discal band is broken, irregular and black and is bordered by a series of red spots outwardly edged with black; and, sometimes, faintly on the inside as well, the subterminal series of white lunules are broadly edged on the outside with black; the grey patch on the caudal region is replaced by ochreous grey. Antennæ black; head, thorax and abdomen creamy white with a medial, broad, longitudinal band; the abdomen with lateral, black stripe; the thorax suffused with grey.—Expanse 68-95mm., the males being the same size as females.

Larva.—The caterpillar is greatest in diameter about segments 4, 5 and the dorsum is somewhat flattened, the sides being in a plane at right angles to it: the transverse section being a trapeze though, of course, with the corners rounded, the ventrum-base being the shortest side; it decreases in diameter rather rapidly to anal segment which is narrow, smooth, rather long, ending in two straight, diverging, squarely separated, triangularly conical points; segments 2 to 4 are conspicuously flat on the dorsal portion. The head is greenish yellow in colour, round, more or less hidden under segment 2 in repose; the front margin of segment 2 straight. Segment 2 is about twice as broad at the front margin as the larva is at anal extremity. The ventrum is flattened. Segments 2-4 have each a short, lateral, conical, sharp, black spine, centrally situated and all of equal length. Spiracles are small, oval, finely bordered with black. Surface is dull, smooth. Colour of larva is grass-green with a subspiracular, yellowish line; top of segments down to the lateral region is greeny-whitish with a broad, dorsal, olive-green band, generally indistinct on segments 2-4; every segment except the last has two depressed brown lines across the greenish-white part parellel to the front and hinder margins, giving the appearance to each segment of having three folds; segment 4 has four such folds, the three anterior of which are black; there is a brown, interrupted, lateral line bordering the dorsal greenish-white area of all segments; ventrum light green. The osmeteria are shiny, glossy green in colour. Some larvæ have black instead of brown in the above description and in this case the dorsum instead of being greenish-white is black with or without two or three short, transverse lines laterally to each segment 6-11 forming a dorso lateral interrupted band on each side. Sometimes the colour may be dark, rusty brown instead of black and then the lateral band of short white marks is wanting. L: 32mm.; B: at segment 4-5, 9 mm.; H: at same place, 7 mm.

Pupa.—The pupa is square-fronted pointed behind, with two well separated

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head processes and a short one on thorax, base of this latter process nearly perpendicularly over anterior end of pupa, ventrum flattened, dorsum transversely convex. Head with two short, thick, diverging, square-topped processes, slightly compressed dorsally and ventrally, ventral side being in the plane of the pupal ventrum. Segment 2 nearly perpendicular to longitudinal axis of pupa as to its dorsal line ; the dorsal line of thorax parallel to that axis, the apex produced out over slope of segment 2 into a 1·5 mm. long, 1 mm. thick, flat-topped point at an angle of 105° with front slope of segment 2, the dorsal side of it in continuation with dorsal line of pupa to which it is inclined at 135° ; the inner margin of wing (lateral line of pupa) is raised on ridges, the ridge running up to and on to the thoracic process : there is no constriction about segment 5 ; the wings are expanded slightly in a rounded curve laterally at segments 5 and 6 where the pupa is consequently broader than anywhere else ; the dorsal line from cremaster farward to apex of thorax is slightly convex, the ventral line is quite straight ; cremaster is 4-sided, hollowed out ventrally in the middle somewhat, narrower at end than at base ; the abdomen is somewhat 4-sided in transverse section, the ventrum and dorsum being flattened. Surface is rugose with exception of wings, dull. Spiracle of segment 2 indicated by circular depression or pit divided by the segment margin 2/3 which crosses it as a ledge, the spiracle being situated at the bottom of the front half ; other spiracles are oval with central, narrow, raised yellowish ovals, and are the colour of the pupa. Colour of the pupa is a very dark rosy brown with the ridges lighter. L : 26mm. ; B : 9mm. ; H : 8mm.

Habits.—The egg, of the usual shape and colour, slightly shiny, is laid singly on the upperside of a tender leaf where the young larva, emerging, lives in the usual way : lying along the midrib near the point on a bed of silk. It is dark in colour when it first emerges, has the usual forked spines and is distinguished by having a dorsal white region on abdomen. It is sluggish, walks with a halting gait and wanders very little except at the end when about to pupate. At that time it turns pinkish all over under the former colour and, descending to the ground, gets under a stone, a clod of earth, or under a dead leaf where it strings itself up by the tail and a short, tight body-band in a horizontal position more or less, its back downwards, and there undergoes the change into the pupa in semi-darkness. The butterfly has only one brood as a very general rule ; the early caterpillars of April-June, of which there are always few, form pupæ some of which emerge in a fortnight or so ; but the great majority of the chrysalides lie over for ten months or more until the following year produces another crop of tender leaves. The foodplant is *Saccopetalum tomentosum*, Hooker, which loses most of its leaves during the hot weather and shoots profusely with the first rains when the butterfly is always most numerous. Dr. K. Jordan says that *Polyalthia longifolia*, Benth and Hooker, is eaten by the larva also. These two plants belong to the family *Anonaceæ* and the former is spread throughout India in the Plains and in the Hills. The insect is found in Sikhim; Central and Southern India; Ceylon. In Bombay the butterfly is found throughout Kanara, Belgaum, in parts of Dharwar, Bijapur and, doubtless, in many other localities in the plains, hills, forests and cultivated lands, and is very plentiful in certain places in the early monsoon months; it occurs from sea level upwards but nowhere, seemingly, at any great elevation; 2,000 feet to 3,000 feet seems to be about the limit. It flies fast but somewhat weakly, much closer to the ground than *P. antiphates* as a general rule, probably owing to the habit of the pupa. It is moderately fond of flowers, comes readily to damp patches of sand in the river and nalla-beds and to moist mud on roads in the hot pre-monsoon days in company with other butterflies and has the same ways of resting as *P. antiphates.*

P. aristeus, Cram., a very closely allied species nearly exactly similar, inhabits, with its subspecies, Sikkim, Assam, Burma, Tenasserim, Sumatra, the Malay Peninsula, Borneo, the Philippine Islands, many of the smaller islands of the Malay Archipelago, Aru, New Guinea and Queensland in Australia. *P. rhesus*, Boisd., is a very black species that inhabits Celebes.

93. **Papilio doson,** *Lin.*—This species was formerly known as *telephus*, Felder, also *doson* of the same author. It is now treated mostly as a subspecies of *P. eurypylus*, L., by lepidopterists.

Male and female *upperside*: black. Forewing: three slender, oblique, short, pale green streaks in basal half of cell and two irregular, small similarly coloured spots near its apex; a discal band composed of pale green spots that gradually diminish in size anteriorly, the spot in interspace 5 the smallest, the two in the interspaces above it slightly larger; a spot at base of interspace 7 and a sinuous, complete, subterminal series of similarly coloured ones. Hindwing: a transverse band that extends as far as interspace 2 posteriorly and is a continuation of discal band on forewing; the upper portion of this band white, the lower pale-green: this is followed by a sinuous, subterminal series of small, pale-green spots as on the fore-wing. *Underside;* brownish-fulvous black; markings similar, larger, their edges slightly diffuse and all of a silvery white, slightly tinted with pale green. Hind wing, in addition, has a white, basal streak that extends halfway down the dorsal margin; another shorter, white subbasal streak from costa to the subcostal vein coalescent with the white of the discal band in the cell, the streak of ground-colour that lies between this subbasal band and the discal band jet-black, interrupted, where it crosses vein 8, by a crimson bar; finally, quadrate black spots near the apex of the cell and at bases of interspaces 1, 2, 3, all outwardly margined crimson. Antennæ, head, thorax and abdomen black; beneath the palpi, thorax and abdomen touched with white; the abdomen with dingy white, lateral line. The abdominal fold of the hind wing of the male is grey within with a fringe of white hairs.—Expanse 76-90 mm.

Larva.—The shape is similar to that of *P. nomius* though not so angular looking. The head is round, green, generally retracted under segment 2. Segment 2 is convex with a straight front margin with a small, black-tipped conical, horny spine or tubercle dorsolaterally on the margin; segment 3 increasing in width backwards, rather long, convex, ascending in dorsal line to segment 4 which forms the highest part of the body. Segment 5 is equally high and the region about the common margin of segment 4 and 5 is the broadest part of the body; the larva decreases in diameter thence backwards gradually, the transverse section always circular flattened ventrally; anal segment narrow, oblong, flattened dorsally, produced beyond claspers and ending narrowly in two diverging, not very long, more or less rigid points. Surface smooth, velvety, dull, head and ventrum downy, with a short, sharp, conical, shiny black conical spine laterally on segment 4. Spiracles oval, white, with a thin, black border. Colour bright grass-green, the lateral spine on segment 4 surrounded by a yellow 'eye,' with a subspiracular white band from segment 5 to anal end, the tail-points also white. The osmeteria are lemon-yellow in colour. The larva is sometimes black or very deep brown instead of green; always black in its early stages with the tail-points pure white; the egg-larva spined as usual; the segmental skin is always very dark green in colour. L: 38mm.; B: 10mm.; H.: 10mm.

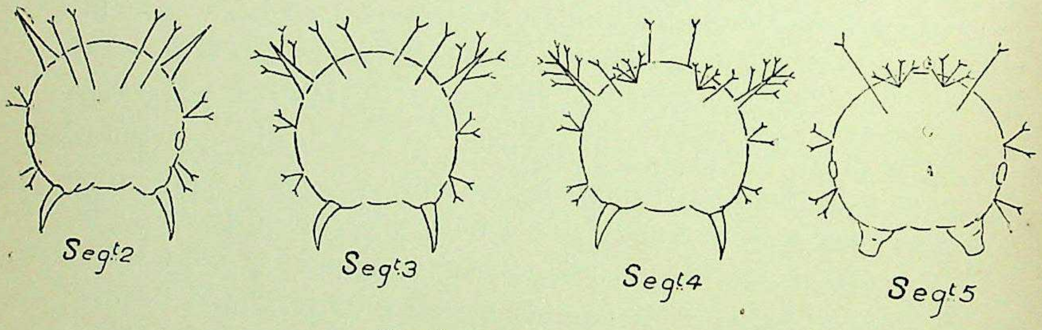
Pupa.—Of the same type as that of *P. nomius.* Head prominently convex between the pear-shaped, bulging eyes; each eye with a short, conical anterior point, the front margin of pupa convex between them; segment 2 inclined to longitudinal axis of pupa at an angle of 45°, pentagonal more or less in shape, the longest side being the hinder margin, somewhat convex; thorax in the same plane of ascent as segment 2, perhaps slightly steeper, to the base of the long, thick, apical process which runs out from apex at right angles to front slope at an angle of 30° to longitudinal axis of pupa, and having its dorsal edge in continuation with dorsal line of pupa: this process is straight, rounded at extremity, keeled on four sides dorsally, ventrally and laterally; these keels continued down dorsum of pupa as far as hinder margin of thorax, to meet the lines of wings continuing the tornal half of the terminal wing-margin on segment 5; and, anteriorly, on to the vertex of head; the broadest part of pupa is at segment 8; thence it decreases to anal end gradually, the cremaster being strong, continuous with body, 4-sided, with ventral, beaded extensor-ridges; wings slightly expanded at segment 7. Surface minutely indented; on thorax above wing margin, is a small tubercle or rising. Spiracle of segment 2 indicated by a narrow, oval, yellowish slit bordered in front by a coarse ledge; other spiracles are narrowly oval, yellowish, not large. Colour olive-green, margins of segments and keels whitish yellow as well as the two lateral lines on abdomen, one to each side. L: 30mm. along dorsal line to end of process; 29mm. along ventral line to front of head; B: 10mm. at segment 7; H: 10mm. at the same point; L of thoracic process: 4·5mm. by 1·5mm.

A diagrammatic representation of the spines of the egg-caterpillar is given below.

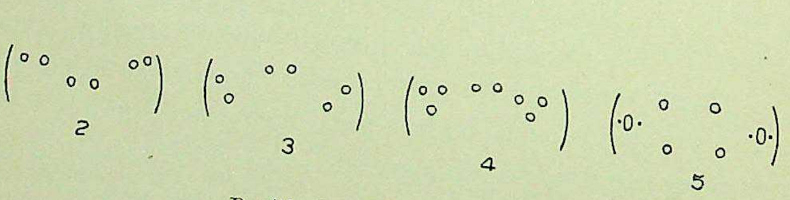
Habits.—The egg is laid in the same manner as that of *P. nomius* which it resembles in every way. The little larva has exactly the same habits and the grown caterpillar behaves in the same way exactly except when it comes to pupation. *P. doson* larva strings itself up to a twig, branch, underside of a leaf on its foodplant or some adjacent tree or shrub by the tail and a short body-string. The pupa does not as a rule lie dormant like that of *P. nomius* for any time but, when kept in captivity towards the cold weather, without a chance of dew or moisture of any sort, it will lie over for months like many others. The colour of the pupa varies of course with the colour of the surroundings it is formed in, also like most others. The butterfly is one of the most powerful fliers of the whole genus and is fond of sunshine and flowers though it merely sips at these in a perfunctory way, wasting no time at any one blossom; it always seems to be in a great hurry and can only be seen at rest when sipping the moisture on roads and in the beds of nallas in company with others of the genus and the stronger winged *Pieridæ*; even then it is easily disturbed and flies straight away as a very general rule. It is extremely plentiful in Kanara in the hot months and rains, may be found at any time of the year, but seems to be confined to the hills and jungles from the sea upwards; it moves at all heights; rest, when drinking, with the wings closed over the back and has a skipping flight very similar to the next two species. It is found in Ceylon and Southern India in the hills and jungles. The foodplant of the larva is the anonaceous *Saccopetalum tomentosum*, Hooker, and *Unona Lawii*, Hooker, upon which it has been found; and doubtless other *Unonæ*.

There are many sub-species extending throughout India, Burma, into China, down through Tenasserim and the whole of the Malayan Region, to Australia; also north to Japan. *Papilio evemon* Boisd. from Malacca, Sumatra, Java, Borneo is very like it; also *P. procles*, Grose Smith, from North Borneo, and Kina Balu; *P. bathycles*, Zink, from Java, Sumatra, Borneo, Assam, Burma; *P. isander*, Godm. and Salv., from the Solomon Islands, &c., approaches *P. sarpedon*, L., forming the connecting link between it and *P. eurypylus* according to Rothschild.

Diagrammatic transverse sections of segments 2 to 5.



Papilio doson, 1st stage.



Papilio doson, dorsal plan.

94. Papillo sarpedon, *Lin.*—Male and female *upperside*: opaque black. Fore and the hind wings crossed from above the tornal area on the hind wing to near the apex on the forewing by a semi-hyaline, broad, pale-blue, medial band which is broadest in the middle, more or less greenish and macular anteriorly ; the portion of the band that crosses interspaces 6, 7, 8 on the hind wing white ; beyond the band on the hind wing there is a subterminal line of blue, slender lunules. *Underside* similar, ground-colour dark brown. Hindwing : a short, comparatively broad, subbasal band from the costa to subcostal vein, and the postdiscal area between the median blue band and the subterminal lunules velvety black traversed by the pale veins and transversely, except in interspaces 6 and 7, by narrow, crimson lines ; lastly, a crimson spot near the tornal angle with an admarginal yellowish-white spot beyond it. Antennæ, head, thorax and abdomen brown, the head and thorax suffused with greenish grey; beneath the palpi, thorax and abdomen touched with dingy white, the abdomen with two whitish lateral lines on each side. The male has the abdominal fold of hind wing grey within, furnished with a tuft of long, stiff, white hairs. Expanse 81-95mm.

Larva.—"The young larva is black or dark green, with numerous spines of which those on the metathorax are long and bristly ; when full grown, green, beneath lighter, with a pair of short spines on each of the three thoracic segments and on the last segment ; on the metathorax a yellow transverse band and from the metathorax to the anal segment a yellowish stripe above the legs ; on *Machilus oderatissima, Geijera salicifolia, Litsea, Alseodaphne, &c.*, and especially *Camphora officinalis*, where this tree has been imported. The yellowish egg is laid singly on the leaves and shoots of the food-plants." (*Dr. K. Jordan.*)

Pupa.—"Pupa green, the thoracic horn slenderer, more pointed and straighter than in the allied species, the lateral ridges extending downwards from the horn straight, between this carina and the frontal one a very slight, somewhat curved, vertical ridge."

De Nicéville gives a figure of the pupa in his paper "The Butterflies of Mussoorie," published at page 595 of Vol. XI of this Journal (the Journal of the Bombay Natural History Society), and says that the foodplant of the larva is *Machilus oderatissima*, Nees, Natural Order *Laurineæ*. He also states that the pupation takes place in June and the imago emerges in the following spring presumably because the climate up there in Mussoorie is very cold during the winter ; so that the butterflies behave like they do at home in England. *P. sarpedon* occurs throughout Continental India (except South India and Ceylon) to Java, the Philippines and Japan ; and has a subspecies, *semifasciatus*, Honr., in China.

95. Papilio teredon, *Felder* (Pl. D 5, fig. 30 ♂, 30*a* ♀.—This is a slightly differentiated form of the above, distinguished in both sexes by the narrower medial band crossing both wings. The colour is brighter, the contrast between the green of the upper and the blue of the lower portion of the medial band more vivid. Hindwing more produced posteriorly at apex of vein 3 where it forms an elongate tooth or short tail. Expanse

74-90mm.; the males on the whole being about the same size as the females.

The last small spot of the wing-band just below the costa may be entirely wanting; indeed is generally wanting in the females from North Kanara.

Larva, 1st Stage. (*vide* figs. overleaf).—Shape: swollen in segments 3, 4, 5, thinning off to tail which is only half the width of segment 4. There is a large fleshy, supraspiracular tubercle on segments 3, 4, 14 which is dorsolateral on segment 2: the one on segment 2 being on front margin, that on segment 14 on hinder margin and the rest in centre of respective segments. These tubercles are long, conical, covered with little fine spines which are longly bifurcated at ends. There are four bifurcated shafts on front margin of segment 2; in a row between the dorsolaterals there is also a row of 4, similar shafts on segment 3 between the supraspiraculars; the same on segment 4: subdorsal and dorsolateral. On segments 4 to 12 there is a subdorsal, circular, ochreous tubercular spot set with 5 or 6 bifurcated shafts. On segments 5 to 12 there is a lateral tubercular spot with a single bifurcated shaft. On each segment 2 to 12 there is a supraspiracular tubercular spot with a short and a long bifurcated shaft and, under each spiracle, a similar spot also with two bifurcated shafts; and on the base of each proleg or in a corresponding region (where there is no proleg) a pair of similar bifurcated shafts. Segment 13 has the same arrangement of spots with shafts as the other segments. The spiracles are very small and black. The head is round, lightish brown-orange in colour, with a broad, dark band across from eyes to eyes; eyes are black; clypeus large, triangular; labrum, antennæ and jaws same colour as head, the last with tips dark. Colour of larva is green with the tubercles of segments 2, 3, 4 ochreous, those of segment 14 as well as that segment itself, white; a dorsal, sublateral and lateral brownish longitudinal band the whole length of larva; belly and prolegs white; true legs transparent white; all bifurcated shafts are black; the shafts of dorsolateral tubercles of segment 14 (tail points) are simple, not bifurcated. Segment 14 is flat and trapeze-shaped. L: 6mm.; B: 2mm. in broadest part without shafts.

2nd Stage.—The bifurcated shafts have all disappeared. The conical tubercles of segments 2 and 14 still exist but are now covered with simple, spinous hairs; the dorsolateral tubercles of segments 3 and 4 are very much shortened and similarly covered with hairs. The whole surface of the body is covered with fine, extremely minute, dark, pointed hairs. The head is round, orange, spotted darker, with the eyes brown. The colour of larva is dark olive-green, with the scars of the tubercular spots of 1st stage light; anal segment with tubercles thereof white; the subspiracular region whitish; a spiracular white line from segment 5 to segment 13; dorsolateral tubercles of segment 2, 3 and 4 shiny black. Spiracles light brown surrounded by a black line. Shape same as 1st stage. L: 12mm.; B: 4. 5mm.

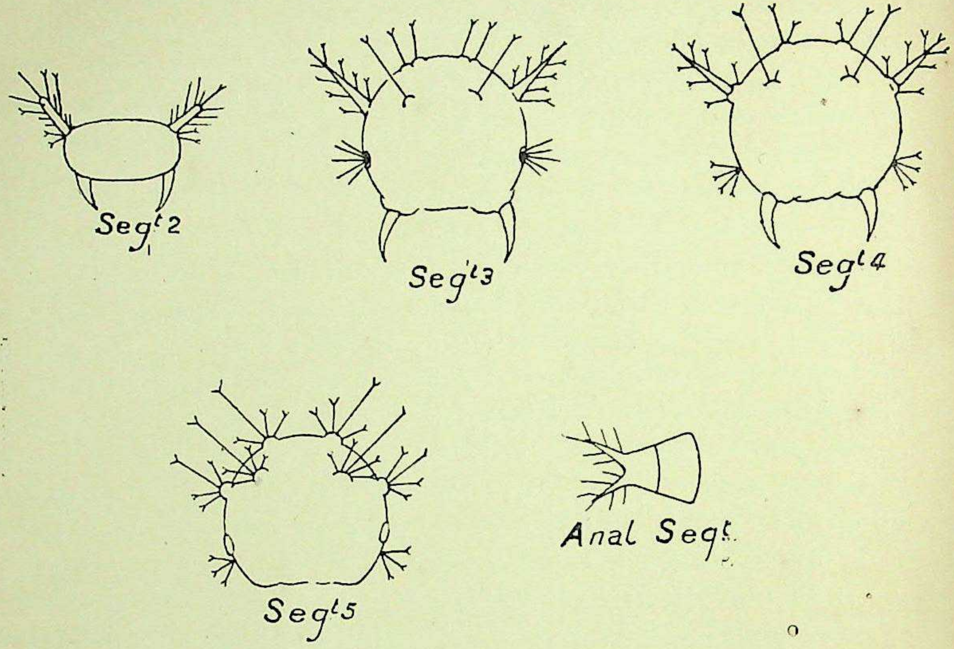
3rd Stage.—Similar to the 2nd stage in every respect as to shape and spines and colour. The L: 15 mm.; B: 5-5mm.

4th Stage.—Similar to the 3rd stage in every respect except that the hairs covering the body are now mere indications showing as black pin-points, being hardly raised. There is an indistinct, lateral, longitudinal, white line from segment 4 to segment 13; a subspiracular line or narrow band, yellow. L: 19mm; B: 7mm.

5th Stage. (Pl. C. fig. 16).—The shape is the same as in the 4th stage except that the dorsolateral tubercles of segment 4 are triangular, flattened before and behind, shiny black at base and white on side, surrounded at base by a black line, the two tubercles connected across the segment by a distinct yellow ridge; the dorsolateral tubercles of segments 2 and 3 are similar in shape but considerably smaller: they are shiny and have a few minute hairs on them. The anal points are as in 4th stage. The head is green with a yellowish tinge with black eyes; covered with fine hairs which are light in colour. The body is likewise covered with extremely minute, light hairs. The colour is a fine rich green with segments 13 and 14, spiracular region, legs and prolegs greenish-white; there is a fine yellow lateral line and subspiracular yellow band from segment 6 to segment 13; the dorsolateral tubercles of segment 2 and 3 are white and black. L: 28mm.; B: 10 mm.; when stretched; L: 34mm.

Pupa. (Pl. 1, fig. 13a)—Is very like that of *P. doson* in shape, except that here the thoracic process is at an angle of 45° to the longitudinal axis of pupa instead of 30°. Eyes prominent, with each a short point anteriorly, these points separated from the very slight dorsal ridge of head by a small sinus on each side of it; a ridge runs from the point of thoracic process down it on each side laterally, and in a curved line to the dorsal margin of wing along which it runs to about the middle of segment 8, being slightly thickened about the centre of the wing-margin; another ridge runs down the front of process and one posteriorly, the former continued down the dorsal line of head, the latter down the dorsal line of segments 4, 5 dividing into two diverging to become subdorsal, then lateral, gradually in an even curve, these two being widest apart about middle of abdomen whence they again converge to meet at base of cremaster; there is also a slight spiracular ridge from cremaster forward to thoracic process; but none of these carinations are pronounced; the shoulders are only slightly prominent and have each a short, low ledge at an angle to the plane joining spiracular lines; the cremaster is stout, square in transverse section, truncated at end and carinated down each of the four sides lengthways, continuations of the body carinæ. Surface minutely and shallowly rugose Spiracles of segment 2 not any way peculiar; others longly oval, small colour of body. Colour rather light green, all the ridges light yellow. L: 31mm.; B: 10 5mm.; H: 8mm.; L: of thoracic process: 9mm.

Diagrammatic transverse sections of segments 2 to 5.



Papilio teredon, 1st stage.

Habits.—These are very much the same as for *P. doson*. The egg is deposited singly on the top of a leaf, generally a tough one, in a shady place in the jungles. It is of the usual type. The little larva eats the egg shell and makes a seat in the centre of the leaf, generally at the base, spinning copious white silk for the purpose. The full grown larva is very sluggish, walks slowly and haltingly and does not wander far to pupate. The change takes place generally on the underside of a leaf where the larva suspends itself with a strong tail-pad and a close body-string. The butterfly is probably the strongest and swiftest flying of the whole genus; it is generally seen sprinting along jungle paths or hurrying over low shrubs and up into the air over the foliage of the highest trees, keeping more to the open, in the sense that it does not dive amongst the undergrowth and into thick places, than any of the other swallowtails. It frequents flowers in much the same intermittent, restless way as the last species and forms one of the lot that visit damp sand and wet mud in the hot weather. It rests with the wings closed and may be found at any time of the year in the hilly forest regions of the Western Ghats in Bombay. It is a jungle species inhabiting the country at all levels from the sea up. The food-plants of the larva are belonging to the *Laurineæ* and it has been bred on *Cinnamomum zeylanicum*, Breyn, *Alseodaphne semicarpifolia*, Nees, *Litsea chinensis*, Lam., *Machilus macrantha*, Nees. Many of these are great big trees but the butterfly generally chooses small saplings or low shoots to lay on. *P. teredon* is confined to Southern India and Ceylon and is said to be found nowhere else.

Other *Subspecies* are *parsedon*, Westw., from Timor and other Malayan Islands, with a longer tail than *teredon* ; *choredon*, Feld., from Australia and New Guinea with a broader band ; *anthedon* Feld., from Amboina, Ceram, with large, strongly arched submarginal spots to hind wing ; *milon*, Feld., from Celebes, &c., with all the spots of the band separated. *P. cloanthus*, Westw., from North India, Assam, Shan States and China has a fine subspecies *sumatranus*, Hagen, with a very broad, yellowish green band, occurring in Sumatra.

Habits.—The eggs are laid singly on young shoots, generally of small young trees or saplings, in shady places, and generally on the upper surface of leaves. The larva always lies on the upper surface in the centre of a leaf ; when alarmed, it throws out a stiff, jelly-like process with a short base and two long diverging, cylindrico-conical branches of a light, translucent lemon-yellow colour from the membrance between the vertex of the head and segment 2 ; this process contracts into itself slowly when withdrawn ; it smells strongly of the leaves of the food-plant when crushed —this organ is the osmeterium.

The coloured figure of male and female (figs. 30, 30a) on plate D5 show the upperside not black enough, the blue band perhaps too green, certainly not bright enough ; there is too much red shade about it as usual. The same may be said of the undersides. The difference in length of the tail to hind wing in the two sexes is too much accentuated.

96. Papilio agamemnon, *L.* (Pl. D5, fig. 29).—Male *upperside* : black. Forewing with the following green markings : a spot at the extreme base of the costal margin, a transverse, short bar near base of cell and seven spots in the cell beyond, two and two, except the apical spot which is single: two spots beyond cell-apex; a spot at base of interspace 1*a* and 1 followed by two, short, oblique, macular bands; a discal series of spots, decreasing in size towards the costa and a postdiscal series of smaller spots that begins with two in interspace 1; the spots in interspace 7 in both series are out of the line, placed outwards. Hindwing: three series of similarly coloured markings that run transversely across the wing more or less parallel to the dorsal margin, the upper markings, (these in interspace 7, that is) white: a short, greenish stripe at the extreme base of the wing. *Underside*: fuliginous brown or brownish black, more or less suffused with pink along the costal margin, on apical area and along the outer margin of the discal markings on the forewing, broadly along the dorsal and terminal margins and at base of interspaces 6 and 7 on the hind wing; markings similar to those on the upperside but less clearly defined and somewhat more grey in tint. Hindwing black, inwardly red-margined spots superposed on the pink area in interspaces 6 and 7. Cilia very narrow, pale pink. Antennæ, head, thorax and abdomen black; thorax above and the abdomen on the sides streaked with greenish grey; beneath ochreous grey, touched on the thorax with pink. Female similar, but with a streak of greenish white along the dorsal margin on both under and upper sides.—Expanse 90-102mm.

The ground-colour of the underside is somewhat variable; this, in some specimens, is much paler than in others and varies also in the amount of tint of pink suffusion. Burmese specimens generally have indications of a more or less complete series of red spots on the underside of the hindwing in continuation of the red spots at base of interspaces 6 and 7: in this they approximate to the Andaman and Nicobar race.

Larva.—Like that of *P. doson*. Head of the usual shape, large, green. The body is the same shape as that of *doson*: is swollen, about segments 4, 5, decreasing perfectly regularly to the end, the sides of the body more or less perpendicular from the flattened ventrum; the thickest part is at segment 4; the anal segment is narrowed, more or less square at extremity, ending in two simple, curved, divergent spines which are separated at their bases by an interval equal to their own length; segment 2 has a dorsolateral simple, thin, pointed metallic blue-black spine on front margin which is 1·5 mm. in length; the two directed out in front and diverging one from the other; segment 3 has two similar, smaller, curved spines, one on each side, laterally and centrally; on segment 4 are two longer, similarly situated spines of 2 mm. in length (one to each side), from an orange spot. These spines are brittle and break off easily from the base. Surface of body smooth, dull, the segments well marked, though the margins are in no way constricted. Spiracles rather small, oval, black. Colour of body dull grass-green, obscurely blotched darker; a double white subspiracular line from segment 5 to anal end. The osmeteria are light yellow in colour. L : 38mm. ; B : 10mm.

Pupa.—Like those of *P. doson* and *P. teredon.*—Head very slightly convex across frons with two small, short, though prominent cones, one on each eye; segment 2 and head form together, seen from above, a square, slanting up from front of pupa at an angle of 75° with longitudinal axis of pupa to base of thoracic process; thorax little broader than segment 2, its front slope to base of process at an angle of 75° to the pupal length-axis ; the process 2·75mm. long, stout (1mm. by 2mm.) laterally compressed, rounded at extremity projecting out in front, perpendicular to the front slope of thorax, continued dorsally backwards in a straight line with dorsum of abdomen, there being no constriction ; the wings are expanded laterally into a narrow ledge ; the abdomen is more or less square in transverse section and diminishes gradually in diameter to cremaster ; the cremaster also square in section ; surface of pupa finely rugose under the lens all over. Spiracles of segment 2 narrow brown slits ; others rather round, moderately large, with a central oval inside which is a raised central slit, colour of the body. Colour grass-green with a row of darker green, subdorsal spots on abdomen ; dorsal margins of wings lined with brown-red and slightly raised, the ridge thus formed running up to thoracic process, starting from front margin of segment 8 ; this red-brown marking is interrupted by an included small, white spot on the common margin of segments 6 and 7 and includes another white, triangular spot at front margin of segment 5 and another at the margin of segment 4 : the apex of this latter spot is connected by a line with a prominent, horse-shoe shape ridge on the shoulder ; edges of cremaster, four of them, white, the two upper ones being produced along sides of abdomen forwards to meet dorsally at anterior margin of segment 4 ; the other two white edges stop at segment 10. L : 29mm. ; B : 9mm.

Habits.—The oviposition, the shape, colour of egg are the same as for *P. doson.* When young the larva lives on the centre of the upperside of a leaf ; when full grown hides in a similar position among the innermost leaves of the plant. It is subject to parasitic attack. The pupation takes place on the underside of a leaf, against a stalk or on a twig, the tail-fixing being strong, the body-loop fairly short. The butterfly is a fast, strong flier and is very fond of flowers ; it has a skipping flight and keeps much to certain beats over bushes and low vegetation where it flies backwards and forwards in the hot sun. It is found in all sorts of country except the very dry regions and is fairly plentiful everywhere in India, both in the jungles and in the open, in the hills and in the plains. It does not go to water like the last few species; at least it is rarely met with amongst the drinking crowds in the nallas and on roads in the hot weather, though it may always be found at flowers all the year round in the Bombay Presidency; it flies earlier and remains later on the wing than any of the others. Like them, it is restless and is not easy to capture except at flowers. The foodplants of the larva are all anonaceous. It has been bred on *Saccopetalum tomentosum*, Hooker; *Anona squamosa*, L.; *A. reticulata*, L.; *Polyalthia longifolia*, Benth. and Hooker; *Unona discolor*, Vahl.; and doubtless feeds upon most *Anonaceæ*. *Anona* is the Custard Apple or *Sitaphal* of India. The distribution of *P. agamemnon* is more or less throughout India, Burma, extending to China and through the Malayan Region to the Philippines, and north to Japan. The subspecies *ligatus*, Rothsch., goes into Australia; *decoratus*, Rothsch., inhabits the Nicobars and Andamans; *salomomis* of the same author extends to the Solomon Islands.

In the coloured figure (fig. 29, Pl. 5), the whole thing is again too red in shade, the upperside is not black enough, the colouring of the underside not delicate enough.

(*To be continued.*)

SOME NEW INDIAN MAMMALS.

BY

R. C. WROUGHTON.

In a paper on the species of the Genus *Rhinopoma* (Ann. Mag. N. H., Vol. XI, p. 496, 1903), Mr. Thomas pointed out that Dobson had lumped two separate species of Egyptian *Rhinopoma*, differing markedly in size, under the name *microphyllum*, Brünnich. Blanford followed Dobson, and accepted the name *microphyllum* for the Indian form. He notes that the forearm measures 2·6 inches but adds "but many specimens are considerably smaller with a forearm of 2·1″ or less."

Among the specimens of *Rhinopoma* in the Cutch collection, of our SOCIETY'S MAMMAL SURVEY, from Bhuj, are representatives of two undoubtedly distinct species, with forearms about 60 and 70 mm. respectively. Either, therefore, we may hope to obtain a third species of the Genus, or Blanford was referring to the Arabian form, since named *muscatellum* by Mr. Thomas (l. c. supra), for there is no known *Rhinopoma* with such a short forearm as 2·1″=52·5mm. in India.

The smaller specimens are undoubtedly *hardwickii*, while the larger, though resembling *sumatræ*, Thomas, in size, are separable as a distinct species, which I propose to call:—

RHINOPOMA KINNEARI,* sp. nov.

A large *Rhinopoma*, about the size of *R. sumatræ* with broader ears and broader, stouter skull.

Fur short, 3-4 mm. on the back. General colour above brownish-drab, warmer in colour than the drab-grey of *hardwickii*; below paler. Face in front of ears, ears, and lower back, naked; in *sumatræ* the fur of the back is continued almost to the root of the tail. Ears broad, 15 mm. (12 mm. in *sumatræ*.)

Skull.—Broad and stout, strongly crested, inter-orbital ridges well marked, a marked transverse ridge on each side, immediately above the nostril, sides of mesopterogoid fossa sub-parallel, anterior end of fossa rounded, extending to level of front of posterior molar (in *sumatræ* the fossa is markedly broad posteriorly, its margins converging sharply anteriorly, the anterior apex not reaching the last molar). Anterior nasal opening markedly larger than in *sumatræ*.

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* Named in honour of the Society's hard working Curator. Mr. N. B. Kinnear.

Dimensions of the Type (recorded by the Collector).—Head and body 80; tail 63; forearm 70; ear 21.

Skull.—Greatest length 22·5 (19, 21·2); basal length, 19·5, (15·5, 18·2); zygomatic breadth, 13·5 (11·3, 12·8); breadth of brain case, 9·5 (9, 9·2). Front of canine to back of m^3, 8 (6, 5·8).

(NOTE.—The dimensions in brackets are those of the type skulls of *hardwickii* and *sumatræ* respectively.)

Habitat.—Bhuj, Cutch.

Type.—Adult male. B. M. No. 11·12·11·1. Original No. 458. Collected 28th August 1911, by Mr. C. A. Crump and presented by the Bombay Natural History Society to the National Collection.

The following is a key to the known species of *Rhinopoma*.

KEY.

A.—Tail shorter than forearm, skull with a transverse ridge, on each side, immediately above the nostril.

- *a.* Size larger, forearm 70-73 mm.
  - *a*^{1}. Ears narrower, 12 mm.; fur of back extending almost to the root of the tail (Sumatra) … … … *sumatræ*, Thos.
  - *b*^{1}. Ears broader, 15 mm.; lower back naked (Cutch) … … … *kinneari*, sp. nov.
- *b.* Size smaller, forearm 65-67 mm. (Egypt) … … … … *microphyllum*, Brünnich.
  = *lepsianum*, Peters.
  = *cordofanicum*, Heuglin.

B.—Tail longer than forearm; skull with a globular swelling on each side above the nostril.

a.	Size larger, forearm 57-61 mm. (India).	*hardwickii*, Gray.
b.	Size medium, forearm 52-55 mm. (Egypt)...	*cystops*, Thos.
c.	Size larger, forearm 49-50 mm. (Arabia)	*muscatellum*, Thos.

When comparing some Pipistrelles collected by Mr. Crump with the series in the National Collection, I found some specimens in the latter which are easily separable from *Pipistrellus mimus*, of which they are the northern representatives. I propose to give them the name :—

PIPISTRELLUS MIMUS GLAUCILLUS, subsp. n.

The northern dwarf Pipistrelle.

A pipistrelle scarcely differing from *mimus* except in size and colour.

Size rather larger than *mimus*, but tail slightly shorter. Fur as in *mimus*. General colour above 'mouse grey' (near 'bistre' in *mimus*), individual hairs grey, with whitish tips; below, as in *mimus*, the hairs are brownish black with long whitish tips; giving a silvery effect on the belly. The ears on the average longer and the tail shorter than in *mimus*.

Skull with the braincase rather shallower, otherwise quite as in *mimus*.

Dimensions.—Head and body 48; tail 28; forearm 29; ear 12.

Habitat.—Multan, Punjab.

Type.—Adult male. B. M. No. 10·1·18·15. Original number 328. Taken on 18th July 1909 by Major H. N. Dunn. R.A.M.C., and presented to the National Collection.

Major Dunn took four specimens at Multan and one at Umbala. They are very even in colouration, and, when mixed in a long series of true *mimus*, may be picked out at a glance. They are no doubt the northern representatives of *mimus*.

I received lately for identification, from the Society, a specimen of a Leggada from Lahore, presenting certain skull characters which seemed to show that it held, to some extent, the position with regard to *Leggada* which *Pyromys* (Vol. XX, p. 996) does to *Epimys.* A closer examination of the series of *Leggada* obtained by Mr. Crump in Cutch, showed that these too (which are undoubtedly *L. sadhu*) had the same formation of the skull and could not therefore be a local race of *platythrix.* Amongst these undoubted specimens of *L. sadhu,* however, are some which, while showing the same mammary formula, are smaller in size and have the peculiar skull formation of *sadhu* less well developed.

I propose to describe them as :—

LEGGADA CINDERELLA, sp. nov.

The Cutch Spiny Mouse.

A *Leggada* of the *sadhu* type with a mammary formula of 4-2=12, but of smaller size, and having the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, closed over.

Size slightly smaller than in *sadhu.* General colouring differing but little from that of that species, *viz.*, drab grey above and pure white below.

Skull markedly smaller, with the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, roofed in.

Dimensions of the type (recorded by the Collector).—Head and body 85; tail broken, but judging from proportions in other specimens about 67; hind foot 16; ear 13.

Skull.—Condylo-basal length 22 (25); basilar length 19 (21); zygomatic breadth 6 (7·5); nasals 9·5 (10); diastema 6 (7·5); upper molar series 4 (4·5).

Habitat.—Cutch State. (Type from Bhuj.)

Type.—Old female. B. M. No. 12·1·9·12. Original No. 321. Collected, 27th July 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained 8 or 9 specimens, some of them at the same places in which he took *L. sadhu.*

The peculiar formation of the mesopterygoid region in the skulls of *sadhu* and *cinderella,* though it has not been recorded in an Indian *Leggada,* is well known in some African forms, where it varies in definition in various species.

The Cutch Porcupine proves on examination to differ from the Dekhan form. I propose to call it :—

HYSTRIX CUNEICEPS, sp. nov.

The Rajputana Porcupine.

A porcupine of somewhat smaller size than *leucura*.

Externally differing but little from *leucura* except in size, and a somewhat paler colouring, especially about the head and neck.

Compared with *leucura*, the skull is markedly smaller and narrower and its greatest breadth is across the squamosal, instead of across the maxillary roots of the zygoma, as in the former. Bullæ noticeably smaller.

Dimensions of the type.—Head and body 680 ; tail 88 ; hind foot 86 ; ear 42.

Skull.—Condylo-basal length 145 (155); basilar length 131 (139) ; zygomatic breadth, at the level of the back of the nasals 72 (85); the same at the level of the back of the parietal 78 (80); length of nasals on median line 71 (80) ; anterior breadth of nasals 33 (35) ; posterior breadth of nasals 34 (46) ; braincase breadth 51 (61); diastema 42 (49) ; postero-anterior length of bullæ 18 (20) ; molar series 34 (32).

Habitat.—Cutch and Rajputana. (Type from Nokania, Cutch.)

Type.—Adult male. B. M. No. 12·1·9·11. Original number 261. Collected on July 14, 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

The skull dimensions given in brackets above are those of an adult male of *leucura* from Khandesh, which, I am satisfied, by comparison with Sykes' type, is true *leucura*.

There is, in the National Collection, a specimen from Rajputana which, except that it is younger, appears to agree in all characters with the present form, and I have therefore proposed the name "Rajputana Porcupine."

In a collection from the Nimar District, made by Mr. C. A. Crump, under the auspices of our Mammal Survey Fund, is a single specimen of a mouse, which is so different from anything recorded, that I propose to describe it under the name of

MUS PHILLIPSI.

Phillips' Spined Mouse.

A small mouse, slightly larger than *Leggada booduga*. Coat composed almost entirely of coarse spines, coarser even than in *Leggada platythrix*, overlying an underfur of shorter colourless hairs.

General colour.—Above, 'drab,' tinged with blackish brown on the back, individual spines of the back pale silvery grey, with rather long (2-3 mm.) dark brown tips; below, pure white; hands and feet white, tail coloured like the back, slightly paler below, well clothed with stout, bristly hairs, which are long for the size of the animal. Footpads 6 as in *Mus*, the granulations of the sole, so characteristic of *Acomys*, entirely absent.

Skull markedly larger than in *Leggada booduga*, about as in the common Indian House-Mouse. The frontal ridges strongly marked, as in *Leggada platythrix*, but diverging more abruptly, in passing backwards from the interorbital region than in that species, so that, seen from above, the parieto-frontal area seems almost 'pyriform,' instead of evenly broadening backwards as in *L. platythrix*, and still more in *Mus* '*manei*.' The dentition is quite that of true *Mus*, the anterior molar being longer than the other two together, and at the same time lacking the forward prolongation of the anterior molar, with its crowning cusp, which characterizes *Leggada*. The palatal foramina reach backwards barely beyond a line joining the anterior edges of the first molars, while in *Mus manei* they extend backwards at least to one-third of the length of the first molar, and in *L. platythrix* to nearly two-thirds.

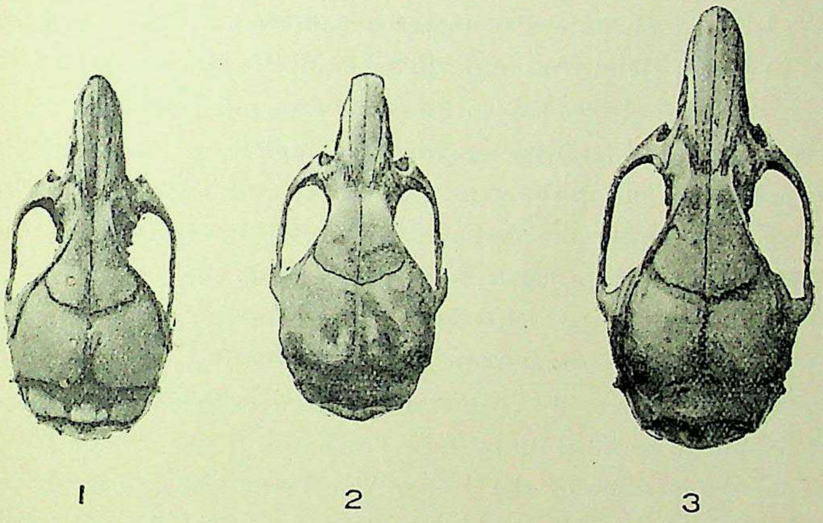
Dimensions of the type measured by the Collector.—Head and body, 79; tail, 60; hind foot, 14. (The ears of the specimen have unfortunately been eaten off by ants.)

Skull.—Condylobasal length, 21·5; basilar length, 18; greatest breadth, 11; nasals, 9; diastema, 6·5; upper molar series, 3·7.

Habitat.—Nimar District, C. P. (Type from Asirgarh. Altitude 1,500.)

Type.—Old male, B. M. No. 12, 3, 2, 1 (Original Number 618). Collected 26th October 1911, by Mr. C. A. Crump, and presented to the National Collection by the Bombay Natural History Society.

This interesting little jungle mouse is separable at once from any form of *Mus* or *Leggada*, recorded from India, by its coat, composed entirely of coarse spines, giving it a strong superficial resemblance to *Acomys*, to which however, as shown by its skull and dentition, it is in no way related. It would be most interesting to know the mammary formula of this species, *i.e.*, whether it has 10 mammæ, like *Mus* or 12 like *L. platythrix*.



No. 1.—*Mus phillipsi.*
No. 2.—*Mus manei.*
No. 3.—*Leggada platythrix.*

The above figures show the skull differences in the three species, the absence of the frontal ridges differentiating *Mus manei* from the other two, and the size and shape of braincase separating *M. phillipsi* from *L. platythrix*.

I have much pleasure in naming this well-marked new species after Mr. R. M. Phillips, D. S. P., Dharwar, who has given such whole-hearted assistance to our Collector.

TERMITES FROM BRITISH INDIA (BOMBAY) COLLECTED BY DR. J. ASSMUTH, S.J.

BY

NILS HOLMGREN (STOCKHOLM).

(*With Plates A, B, C and D.*)

After WASMANN in 1903 published his paper on "Termiten, Termitophilen and Myrmecophilen gesammelt auf Ceylon von Dr. W. Horn, 1899, etc.," the termite fauna of India seems to have been lost sight of by termitologists. WASMANN'S Treatise on the Termites of the Continent of India (contained in the above named paper) is based on extensive material collected by his correspondents in India, Heim, Assmuth, Redemann, Martin, Hoogwerf, and others. As will always happen in such cases, our knowledge of the different species of termites remained incomplete, and it has not yet been possible to fill up the gaps.

As regards the termite fauna of Ceylon, which was dealt with by WASMANN in the paper just mentioned, the collections of Escherich and Green, which I have worked up, have completed our knowledge of it in several points, and the number of species has thereby been increased considerably; however here, too, several gaps remain to be filled up by future research.

As for the termites of the Indian Continent our knowledge of them has been enlarged somewhat by DESNEUX'S description of some termites of Sind.

The latest valuable contribution to this subject comes from Dr. Assmuth, who, I am glad to see, has again begun collecting in the neighbourhood of Bombay and who sent me last year a rich collection (57 tubes) of Bombay termites. There is, it is true, but one new species in the collection, which however is most valuable as completing in a large measure our knowledge of the Indian termites, both as regards the different castes and their several habits.

The following species in British India had been known already:—

Fam. PROTERMITIDÆ, Holmgr.

Hodotermes macrocephalus, Desn.; all castes.

Fam. MESOTERMITIDÆ, Holmgr.

Leucotermes indicola, Wasm.; smaller soldier, worker.
Coptotermes Heimi, Wasm.; imago.

Fam. METATERMITIDÆ, Holmgr.

Termes Estherae, Desn.; all castes.
Odontotermes obesus, Ramb.; all castes.
,, *obesus*, subsp. *wallonensis*, Wasm.; all castes.
, *brunneus*, Hag.; imago.
,, *Horni*, Wasm.; soldier.
Microtermes incertus (?), Hag.; soldier and worker.
,, *sindensis*, Desn.; imago.
,, *mycophagus*, Desn.; all castes.
Microcerotermes Heimi, Wasm.; all castes.
Hamitermes quadriceps, Wasm.; soldier and worker.
,, *Belli*, Desn.; all castes.
Eurytermes Assmuthi, Wasm.; all castes.
Capritermes incola, Wasm.; all castes.
Eutermes biformis, Wasm.; all castes.
,, *Heimi*, Wasm.; all castes.
,, *rubidus*, Hag.; all castes.
Anoplotermes (*Speculitermes*) *cyclops*, Wasm.; imago and worker (*i.e.*, all castes).

Our information about three of them has been enlarged by Assmuth's latest collection which contains the following:—

Leucotermes indicola, Wasm.; imago and larger soldier.
Coptotermes Heimi, Wasm.; soldier and worker.
Odontotermes brunneus, Hag.; soldier and worker.

New for the Indian continent is:—

Odontotermes Feae, Wasm.; soldier, larger and smaller worker (the latter of which is at the same time new to science).

The following is a new species:—

Microtermes obesi, n. sp.; imago.

It is a striking fact that the collection contains no *Protermitidae* whatever.

Though the number of new forms thus discovered is not large, still Assmuth's collection is all the more valuable, as he has added to each number more or less detailed notes on the habitats, etc., which are without doubt among the best I have received from my correspondents. The notes are so instructive and have been made so carefully as to enable me to publish them here with hardly any change. Assmuth is likewise responsible for the photographs 1-7 which are reproduced with this article.[1]

Fam. **MESOTERMITIDÆ,** Holmgr.

Subfam. LEUCOTERMITINÆ, Holmgr.

Gen. LEUCOTERMES, Silv.

Leucotermes indicola, Wasm., 1903.

IMAGO.—Almost identical with that of *Leucotermes ceylonicus,* Holmgr. Antennæ, however, of 16-17 segments (in *L. ceylonicus* of 15 segments). Ocelli generally absent (in *ceylonicus* they are punctiform). Length with wings 9 mm. (in *ceylonicus* 10 mm.).

LARGER SOLDIER.—Very nearly the same as that of *L. ceylonicus,* but antennæ of 15 segments (in *ceylonicus* of 14).

SMALLER SOLDIER AND WORKER.—See WASMANN, 1903. Cf. also HOLMGREN : Ceylon-Termiten, in : ESCHERICH, Termitenleben auf Ceylon, 1911.

Collector's Report :—

BOMBAY, 15-6-1911.—"From the chemical laboratory of St. Xavier's College, room on ground floor; the termites seem to have come out from underground and had almost completely eaten up several boxes of dealwood of which they are specially fond." (Assmuth.)

KHANDALA, 6-6-1911.—"Caught by lamplight in room. Seem to be rather rare in this place and not to occur in larger swarms as is otherwise the case with these termites, since I saw only two or three specimens." (Assmuth.)

Note.—From the above remarks it appears that *L. ceylonicus* and *L. indicola* are very closely allied to, yet different from, each other. The differences are, however, so small as to allow the two kinds to be characterised as distinct races only. I have nevertheless kept them separate, because the interest which attaches to them is precisely based on the slight diversity, not on the similarity of their structure. Both species are in all probability so-called geographical forms of *Leucotermes tenuior*, Hav., from Sarawak.

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[1] Assmuth begs on this occasion to give expression to his deep sense of gratitude to the authorities of St. Xavier's College without whose generous aid the many excursions necessary for collecting the material would have been impossible, and also to Mr. J. P. Mullan, M.A., Assistant Professor of Biology at St. Xavier's College whose able help is responsible for much of the success achieved.

Subfam. **COPTOTERMITINÆ,** Holmgr.

Gen. COPTOTERMES, Silv.

Coptotermes Heimi, Wasm.

IMAGO.—With regard to the tables printed in Zool. Anz. Vol. XXXVII, p. 552, I wish to remark that the measurements of *Coptotermes Heimi* are somewhat larger than stated there and, consequently, nearer to those of *Coptotermes ceylonicus*—

	C. travians, Hav.	*C. Heimi*, Wasm.	*C. ceylonicus*, Holmgr.
Breadth of head ..	about 1·2 mm.	1·3-1·4 mm.	1·4-1·5 mm.
„ „ pronotum ..	„ 1·05 „	1·2-1·3 „	1·3-1·4 „
Length „ „ ..	„ ·6 „	·7 „	·8 „

SOLDIER.—Scarcely different from *Coptotermes travians*, Hav., *ceylonicus*, Holmgr. and *formosanus*, Shir. In *Coptotermes travians* the antennæ are of 14 segments, in the other species of 15.

Measurements.[1]

	C. travians, 4 specimens.	*C. ceylonicus*, 5 specimens.	*C. Heimi*, 10 specimens.	*C. formosanus*, 10 specimens.
Length of head (without mandibles)	1·25-1·36	1·11-1·29	1·29-1·44	1·41-1·48
Breadth of head ..	1-1·16	1·03-1·17	1-1·15	1·04-1·22
Breadth of pronotum	·73-·78	·66-·9	·74-·81	·78-·85

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[1] The tables on p. 192 in "Termitenleben auf Ceylon" are incorrectly printed—see the tables given above.

WORKER.—Same as in *travians*.

Collector's report :—

BOMBAY, 15-3-1911.—Imagines. "Caught by lamplight in room." (Assmuth.)

25-4-1911.—"Termites on footpath behind St. Xavier's College. Had probably been thrown on the road from one of the neighbouring houses or gardens. . . ." (Assmuth.)

20-8-1911—"From St. Mary's College, Bombay (Mazagon) found in room in wooden shelves partly eaten up by termites, and in garden in front of room in stump of tree. Unfortunately specimens from both places mixed up together in same tube by the Collector, Rev. Schurhammer; but possibly both parties belong to the same species." (Assmuth.)—Both are, in fact, of the same species.

Fam. **METATERMITIDÆ**, Holmgr.

TERMES SECTION.

Gen. ODONTOTERMES, Holmgr.

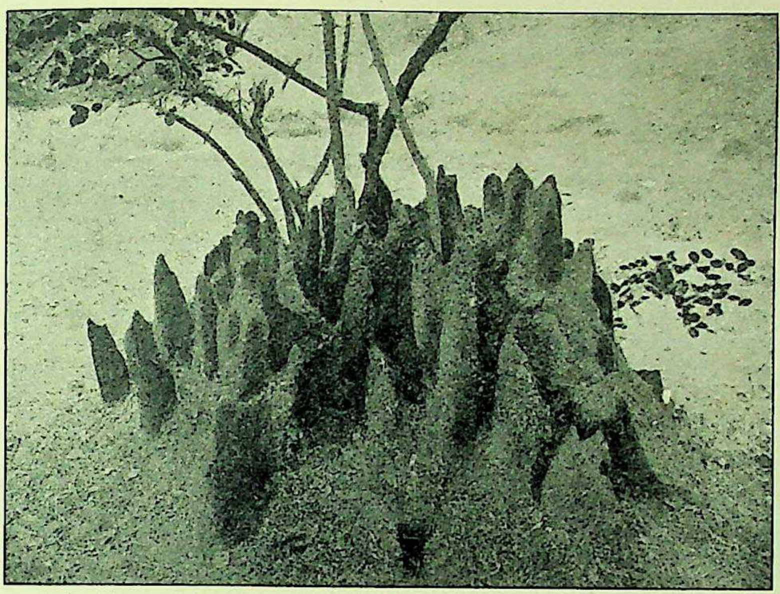
Media of forewing arising from Cubitus. Third segment of antennæ shorter than second.

Odontotermes obesus, Ramb.

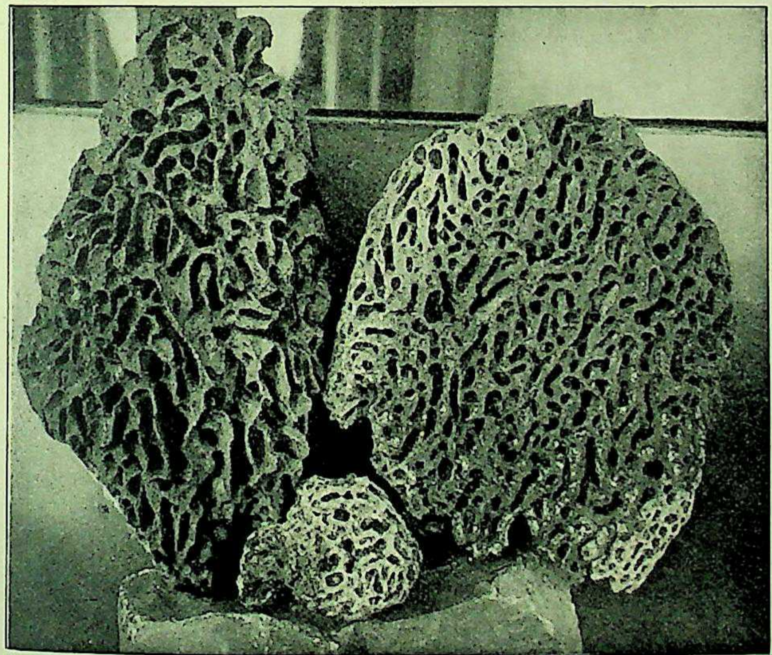
Specimens from numerous colonies and nests are at hand. As stated previously by WASMANN, the species varies rather considerably in size, and also a little in appearance. At first I was inclined to assign the specimens sent to me to two different species; but a closer examination of the material seems to show that the various forms are nothing but different biological types of the same species; for I have been able to insert between the two abovementioned forms an intermediary one containing qualities of both. I propose to name these three forms *Odontotermes obesus a*, *b* and *c*.

Odontotermes obesus a :—Length of head of soldier 1·85-2 mm., breadth of head about 1 mm., length of body about 3·7 mm. Labrum reaching to one-half the length of mandibles. Salivary glands not very well developed.

Odontotermes obesus b :—Length of head (soldier) 1·96-2·03 mm., breadth of head 1·11 mm. approximately, length of body 4·25-4·5



I.—TYPICAL NEST OF *Odontotermes obesus* RAMB. form *a* (Holmgr.).



II.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

mm. Labrum reaching to either one-half, or one-third only, the length of mandibles. Salivary glands same as in *a*.

Odontotermes obesus c:—Length of head (soldier) 2-2·33 mm., breadth of head about 1·33 mm., length of body 5·25-5·4 mm. Labrum reaching to one-third only the length of mandibles. Salivary glands very strongly developed. (Different from *Odontotermes obesus wallonensis*, Wasm.)

Collector's report:—

Odontotermes obesus a.

KHANDALA, 21-1-1911.—"In dry half-burnt twigs and other vegetable remains, which, after being covered with friable galleries of red soil, had—as far as thus covered—been eaten up by termites. Soil used for building galleries evidently not so well cemented with secretions from salivary glands as is otherwise done by *Termes obesus*." (Assmuth.)

21-1-1911.—"Pretty tall mound at foot of bush on low slope." (Assmuth.)

26-2-1911.—"Smaller mound crowned by turrets, constructed on hillside in midst of shrubs." (Assmuth.)

26-2-1911.—"Middle-sized mound at foot of high tree." (Assmuth.)

26-4-1911.—"Hillock nearly 6 feet high leaning against a tree. Two queens, but only one king taken in nest." (Assmuth.)—Imagines of *Microtermes obesi*, n. sp., found in same nest.

22-5-1911.—"Mound built on slope by side of mountain path. Nest deserted, probably pillaged by ants. Fungi grown to long thick white stalks of 10 mm. and more in length. No termites in fungus beds, only a small number of them found in narrow passages constructed in pillars of nest. Nest therefore pillaged in all probability but a short time before. No queen nor royal cell either to be found." (Assmuth.)

22-5-1911.—"Big nest on slope at bottom of shrub, the roots of which were found traversing every part of nest. Fungus beds of strangely bluish colour (in other cases simply brown). Though only small part of nest examined, yet 260 guests taken." (Assmuth.)

25-5-1911.—"Mound on hillside in bushes." (Assmuth.)

Borivli Jungle (Salsette Island), 25-3-1911.—"In dry tree-trunk completely hollowed out by termites."

5-4-1911.—"Nest under bamboo shrubs on slope. Upper height of nest (*i.e.*, measured from highest point where mound and slope met,) 1·25m. above ground, lower height more than 2m. Exterior form and fungus beds as on photos 1 and 2." (Assmuth.)

5-4-1911.—"Nest with broad cupolas at foot of high Targola palm. Fungus beds as on photo 4; as, however, one *Termitoxenia Assmuthi* was taken; I rather think the species to be the common *Termes obesus*. Also some other guests taken in the nest point to the just mentioned species." (Assmuth.)

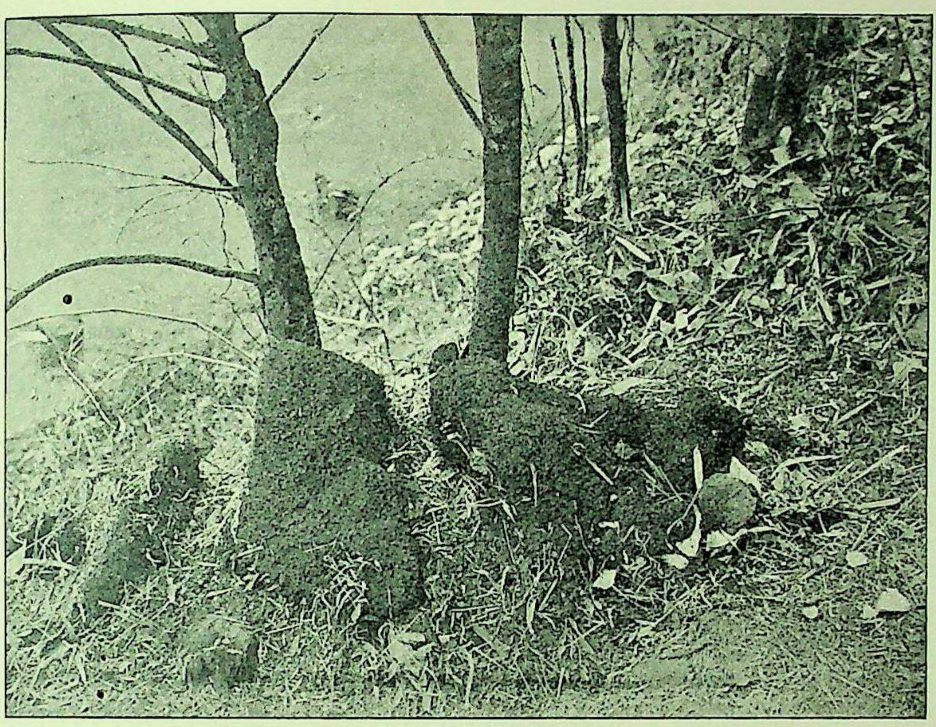
5-4-1911.—"Termites under stone." (Assmuth.)

Aberrant form of a nest.

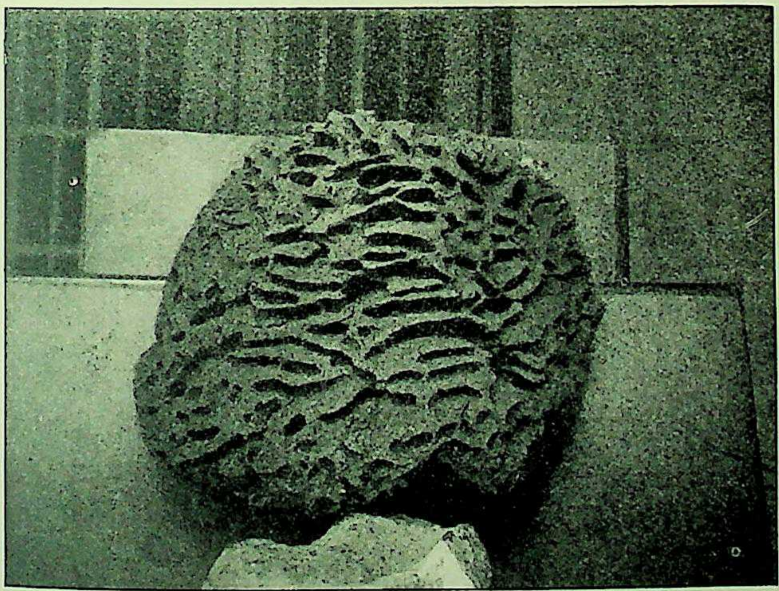
Khandala, 1-5-1911.—"Pretty tall mound on slope, between two trees. Interior of nest quite full of large and small stones, hence most of fungus beds not conical as usual, but some flattened out, others almost cubiform, their forms just fitting into spaces left here and there between stones." (Assmuth.)

Odontotermes obesus b.

Khandala, 2-6-1911.—"Nest on bank of water-course which had dried up after monsoon; river bank about 3 feet high. Upper structure of nest consisting of several very low cupolas each completely separated from the other, the highest of them rising not more than 20 cm. above ground. None of the cupolas showed any perforation, their surface was not smooth, but looked quite weather-worn; in all cupolas an amount of dry grass was found embedded. (Cp. photo 5.) King as well as Queen found after long search, in quite unlooked-for place, about 1 m. from edge of bank and 40 cm. below surface. Though interior of nest showed exceptionally large hollows, yet fungus beds contained therein very small, looking rather like fragments than complete structures. The roof of the beds is a continuous (with large cracks when dried up), slightly convex layer pierced with a number of small holes for the passage of termites (photo 6). *Termitoxenia Assmuthi* in nest which would suggest *Termes obesus*; structure



III.—NEST OF *Odontotermes obesus* RAMB. form *c* (Holmgr.).



IV.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

of nest, however, altogether different from last named species." (Assmuth.)

Odontotermes obesus c.

KHANDALA, 24-4-1911.—"Termites under stone." (Assmuth.)

31-5-1911.—"Nest on small plateau near steep hillside. Upper structure of nest rather small, consisting of four or five blunt peaks (photo 3). The latter completely riddled with holes, just like nests found near Kirkee (*Odontotermes brunneus*, Hag.; see below); their structure, however, not so regularly semiglobular. Fungus beds consisting of a number of more or less parallel layers supported by a good many partitions, the whole arranged in much the same way as in Kirkee nests (photo 4). No queen found. Secretions of biting soldiers as strongly staining as those of *Odont. brunneus*.

N. B.—Examined under pocket-lens, the perforation of the peaks of photo 3 is clearly recognizable." (Assmuth.)

7-6-1911.—"Nest of same structure as preceding." (Assmuth.)

10-6-1911.—"Nest on open ground near coriander-shrub. Fungus beds and outer structure same as described above under *Odont. ob. b.* Diameter of surface area of nest between 2 and 3 m., on which I counted about ten rather broad but very low substructures crowned by some sixty small elevations (photo 5); the highest of the latter rose no more than 20 cm. above ground." (Assmuth.)

BORIVLI JUNGLE (SALSETTE ISLAND), 5-3-1911.—"Mound built round base of tree. Perhaps *Termes obesus*, but fungus beds apparently somewhat different from common type (cp. photo 2), rather like photo 4." (Assmuth.)

25-3-1911.—"Mound without turrets at foot of tree. Fungus beds similar to photo 4." (Assmuth.)

5-4-1911.—"Nest with rather broad blunt cupolas, lying by itself on slope by roadside. Fungus beds pretty near type represented on photo 4." (Assmuth.)

Note.—A typical nest of *Odontotermes obesus* is shown in photo 1. Its overground portion consists of a somewhat semiglobular structure, from which rise a number of more or less pointed turrets.

The diameter of this nest is 2·35 m.; the height of the semi-globular structure, without turrets, averages 56 cm.; highest turret measured from roof of substructure, ·55 cm.; total height of nest which was situated on a slightly inclined plane, 85 cm. on more elevated side of slope, 110 cm. on lower. Mantle of nest not perforated.

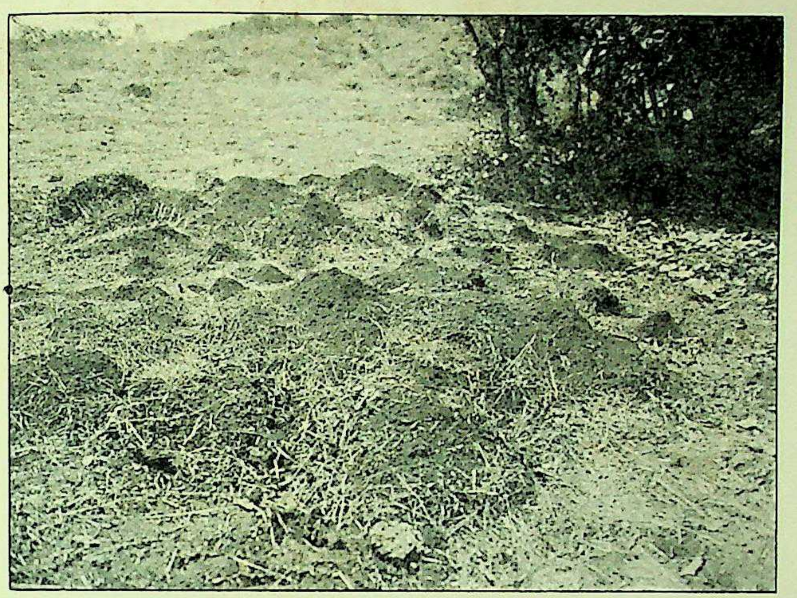
From this normal type the nests of *Odont. ob. c* differ considerably; for the pointed turrets are in this case replaced by small *roundish* cupola-like prominences, the mantle of which is wholly perforated. Moreover the fungus beds within the nest show quite a different formation. If we add to this that the soldiers are a little larger than those of the *a*-nests, with shorter labrum and more strongly developed salivary glands, we should, it would seem, be quite justified in considering the occupants of the *a*-and *c*-nests as two distinct species.

However, this view is contradicted by *Odontotermes obesus b*, the soldiers of which occupy an intermediate position between *a* and *c*, since in *b*-colonies *a*-and *c*-soldiers are found promiscuously. The structure of nest is likewise peculiar in group *b*; its distinctive features are the numerous small prominences or cupolas (cp. with the many turrets of *obesus a*) of low elevation (as in *c*) and completely separated (as in *c*); perforation is absent (as in *a*).

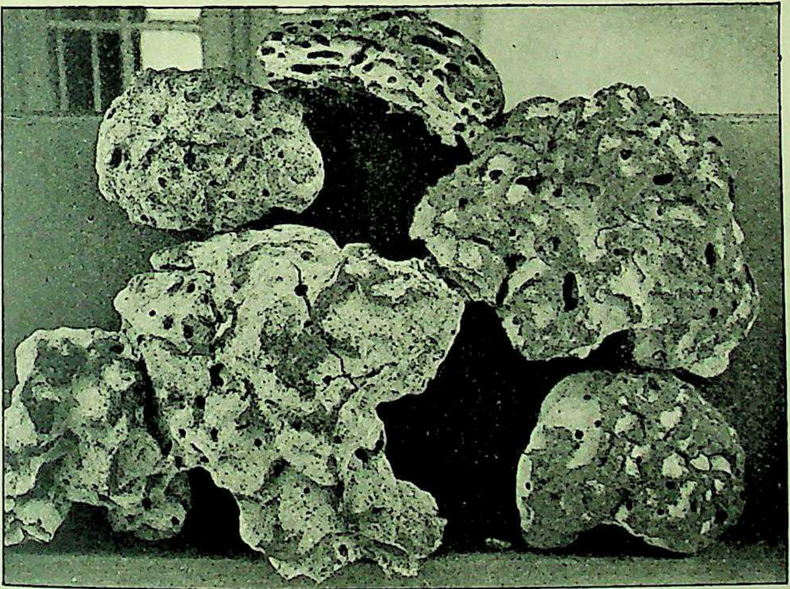
The fourth *c*-nest (examined 10-6-1911; cp. above) is also opposed to the abovementioned view; for it shows the same build as the *b*-nest. Its occupants, however, belong to *O. obesus c*.

The conclusion, therefore, is that the three forms of *obesus* are not entirely distinct biological types; but, as far as I am at present able to judge, the forms merge into one another with regard to their morphological character as well as the structure of their nest.

It is certain, according to Assmuth's information, that *O. obesus* belongs to those species of *Odontotermes* which (like *O. ceylonicus* and *O. Horni*) use secretions of their salivary glands as means of defence.



V.—NEST OF *Odontotermes obesus* RAMB. form *b* [as well as *c*] (Holmgr.).



VI.—FUNGUS-BEDS OF form *b*.

TERMITES FROM BRITISH INDIA.

Though our knowledge of the nests of *Odontotermes* is still somewhat defective—we have so far heard nothing of their general plan of construction nor do we know in what manner fungus beds, nursery quarters, etc., are generally arranged—we may nevertheless compare them with the mounds of the closely allied species *Odontotermes Redemanni.* The fresh, newly built nests of the latter remind one forcibly of the young nests of *O. obesus*, the number of their (*O. Red.*) cones, however, being smaller. Later on even these few cones disappear, the intervening spaces between them being filled up by the workers. As an architect, therefore, *O. Redemanni* seems to have proceeded a step further than *O. obesus*. "Chimneys" are never found in nests of *O. obesus*, whereas with *O. Redemanni* they seem to be of rather common occurrence. Now since the nests of *obesus* are quite as large as those of *Redemanni* it stands to reason that the "chimneys" met with in *Redemanni*-nests, though they *may* also serve the purpose of ventilators, are not primarily built for this end; ventilation is, on the contrary, only their secondary function; for surely ventilation would be as necessary for *O. obesus* as for *Redemanni.* Like TRÄGÅRDH, I believe the "chimneys" rather to be passages for transport used by the termites when building nests. They may possibly be found also in fresh nests of *O. obesus*; but this is not at all necessary, since mound-making termites may quite well build nests without constructing any "chimneys" (cp. nests of *Syntermes*).

Odontotermes brunneus. Hag.

IMAGO.—For description see HAGEN, Monographie der Termiten. 1858.

SOLDIER.—Closely resembling *O. ceylonicus*, Wasm., but somewhat larger, with broader head, and mandibles showing a sharper curve. Antennæ of 17 segments, 4th segment longer than 3rd. (In *ceylonicus* of 16 segments, 4th shorter than 3rd). Left mandible, just beyond middle, with large tooth. Tooth of right mandible in same position but small (in *ceylonicus* rudimentary). Labrum rounded off at tip (in *ceylonicus* pointed). Pronotum deeply bilobed anteriorly (in *ceylonicus* slightly bilobed). Head brown-red, dorsal side of abdomen brownish (in *ceylonicus* head yellow-red, abdomen whitish). Antennæ brown with rings of light colour (in *ceylonicus* whitish).

	O. brunneus, Hag.	*O. ceylonicus*, Wasm.
Length of abdomen	5·5-6·3 mm.	5·5-6 mm.
„ „ head with mandibles.	2·96 „	2·85 „
„ „ „ without mandibles	1·85 „	1·74 „
Breadth of head	1·41 „	1·29 „
„ „ pronotum	1·11 „	1 „

WORKER (two sizes).—Head faintly brownish-yellow (in *ceylonicus* yellow). Antennæ of 18-19 segments[1] (in *ceylonicus* of 16-17 segments[2]), towards the tip brownish (in *ceylonicus* whitish). Pronotum bilobed anteriorly (same in *ceylonicus*).

	Larger worker.		Smaller worker.	
	O. brunneus.	*O. ceylonicus.*	*O. brunneus.*	*O. ceylonicus.*
Length of abdomen	5 mm.	4·5 mm.	4 mm.	3·5 mm.
Breadth of head...	1·48 „	1·37 „	1·04 „	·92 „
„ „ pronotum..	·85 „	·78 „	·74 „	·55 „

Collector's report :—

KHANDALA, 21-1-1911.—"In dry cowdung completely perforated and traversed with tunnels by termites. Outer surface of cowdung, and partly also inner wall of tunnels, scantily coated with red earthy material, as is done by many termites when constructing galleries. Nest proper not found." (Assmuth.)

KIRKEE, 9-5-1911.—"Nest rising about 3 feet above ground, built in garden against brick wall.—The overground portion of nests of this species consists of a tolerably solid, more or less semiglobular, base-structure which, however, is apparently not so much impregnated with salivary secretions and consequently not hardened to such a degree as the corresponding part of *obesus*-nests. It rises sometimes as high as 4 feet above ground (in one case I measured even 6 feet) and is crowned by a number of rounded (not pointed as the turrets of *obesus*) domes or cupolas of the height of 1 foot or so. The domes, which are not solid but riddled all over with small holes, are of poor consistence so that one can easily crumble them between the fingers; the holes serve as passages for the termites. The colour of the soil used for constructing the mounds of this species round Kirkee is black (that of *obesus* at Khandala reddish-brown).—Three queens taken in this nest, each enclosed in separate cell; these cells built close together, about 2 feet above ground. No king found in any of the cells, but this failure perhaps to be accounted for by lack of time which made careful search impossible. The fact that queens' chambers were all situated so high above ground makes me believe that the three queens taken by me were received into nest only a couple of years after its foundation, the original royal pair probably having their quarters lower down in nest. I opened merely upper portion of mound, so no chance to come across primitive royal chamber. Fungus beds similar to photo 4. Soldiers when biting secrete drop of milky fluid like those of *O. obesus*; but quantity of liquid secreted by *O. brunneus* more abundant and consequently brown spot appearing on skin after liquid drying up, larger as well as more lasting. Photo 7 shows palm of my right hand taken 4 days after examining this nest. It was only 6 days later that the spots finally disappeared." (Assmuth).

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[1] In large workers usually of 19 segments, in small ones always of 18.

[2] „ „ of 17 „ „ of 16.

10-5-1911.—"Low mound on flower-bed in garden. Queen about half a foot below surface of ground." (Assmuth).

13-5-1911.—"Mound of moderate size standing by itself in garden. Royal cell with king and queen in middle of nest, level with surrounding ground." (Assmuth).

15-5-1911.—"Very small young nest at foot of babul tree. Queen, with abdomen of strikingly white colour, and king taken." (Assmuth).

15-5-1911.—"Tall mound on open space in small babul-wood. King and queen.—As regards guests taken in this and preceding nests (*Termitoxenia Heimi*, Wasm., *Corythoderus gibbiger*, Wasm., *Chaetopisthes Heimi*, Wasm., etc.), the species tallies well with *Odontotermes obesus*, subsp. *wallonensis*, Wasm." (Assmuth.)

POONA, May 1911.—"Collected from mounds by S. G. Gadgil, Esq., M. A." (Assmuth).

Note.—This species, though doubtlessly very close to *O. ceylonicus*, is, nevertheless, as stated above, well differentiated from it. Biologically the two kinds represent in all probability two different types inasmuch as *O. brunneus* builds mounds of its own, whereas *ceylonicus*, according to ESCHERICH, appears to live as an inquiline in nests of *O. Redemanni* and *obscuriceps*; so far, at any rate, no mounds built by *ceylonicus* have been recorded.

Odontotermes Feæ, Wasm.

IMAGO.—Not known.

SOLDIER.—For description, see *Wasmann*, Neue Termitophilen und Termiten aus Indien, 1896.

I make the following additions:—Soldier very like that of *O. Horni*, Wasm. Head, however, more narrowed anteriorly; mandibles shorter and somewhat weaker; tooth of left mandible placed more towards middle, that of right, central, rudimentary; labrum longer, covering half the length of mandibles. Pronotum distinctly bilobed anteriorly.

Length of body	7-8-9 mm.
,, ,, head with mandibles ...	3·7 ,,
,, ,, ,, without mandibles ...	1·74 ,,
Breadth of head	2·07 ,,
,, ,, pronotum	1·59 ,,

LARGER WORKER.—Close to worker of *O. Horni*. Fontanelle distinct, but not brown. Antennæ of 19 segments, third shorter than second, yet somewhat longer than fourth. Pronotum slightly bilobed anteriorly. Pilosity plentiful.

Length of body	6 mm. (WASM. 5 mm.)
Breadth of head ...	1·92 mm.
,, of pronotum ...	1·15 ,,

SMALLER WORKER.—Antennæ of 17 segments, third very short shorter than fourth, but equal in length to fifth. Pilosity abundant. Pronotum very little bilobed anteriorly.

Length of body ...	...	4 mm.
Breadth of head...	...	1·15 ,,
,, of pronotum	...	·81 ,,

Note.—This species may possibly prove to be merely a race of *O. Horni* of Ceylon.

Collector's Report :—

Khandala, 21-1-1911.—"Termites in room where they had eaten up books and woollen goods[1] after covering them with friable crust of red soil. Room on ground-floor; termites had come up from underground through crack in cemented pavement." (Assmuth.)

7-5-1911.—"Termites in flower pot into which they had found their way, as it had probably been standing in garden over underground nest. Narrow tunnels interrupted at short intervals by small extensions or "chambers"—the size of the latter generally not exceeding that of a monkey-fig—found all through mould in flower pot. Inner walls of tunnels rough, neither smoothed, as with *Odontotermes*, nor blackened, as with *Eutermes biformis*." (Assmuth.)

25-5-1911.—"Under stone in deep ravine." (Assmuth.)

8-6-1911.—"Under stone the surroundings of which clearly showed that this is one of the several kinds of white ants which, during night, cover the surface of ground in neighbourhood of nest with friable galleries and more or less extensive coatings of red earthy material; the termites then eat what they have covered—dry grass, leaves, wood, etc.,—and only as much of it as they have covered, leaving any portions outside the crust untouched." (Assmuth.)

Gen. MICROTERMES, Wasm.

Microtermes obesi, n. sp.

Imago.—Very close to *M. sindensis*, Desn.; chiefly differentiated from this species by the dimensions which are somewhat smaller

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[1] It is remarkable that cotton goods lying in same shelf were covered by termites with galleries, but otherwise left altogether intact.

in *M. obesi*. The total length of the latter, however, as well as the length of its wings is greater. Colour and pilosity either the same as in *M. sindensis*, or colour somewhat lighter. Compound eyes medium-sized (in *sindensis* small). Ocelli big, but little removed from compound eyes (in *sindensis* of middle size, distant from eyes by half their diameter or more). Antennæ of 15 segments. Pronotum relatively small; anteriorly, in the middle, very little bilobed, but distinctly so posteriorly (in *sindensis* insignificantly). Wing membrane with short hair only in outer half (in *sindensis* whole wing sparsely hairy). Wing at tip somewhat pointed (in *sindensis* rounded off).

	M. obesi, n. sp.	*M. sindensis*, Desn.
Length with wings	15·5 mm.	14 mm.
„ without wings	9-10 „	8-9 „
„ of forewings	12 „	11 „
„ of head	1·41 „	1·78 „
Breadth of head	1·29 „	1·44 „
„ „ pronotum	1·29 „	1·41 „
Length of „	·78 „	·92 „

Habitat.—KHANDALA, 26-4-1911.—Taken in nest of *Odontotermes obesus a*, Ramb.

Microtermes (?) incertus, Hag.

It is a discovery of WASMANN (1902), which I am now able to corroborate to some extent, that *Microtermes incertus*, whose original home is presumably Africa, occurs also in India near Bombay; for in the collection before me there are two tubes containing soldiers as well as workers of the *Microtermes* group. They do not differ perceptibly from *Microtermes incertus*, Hag., save that the pilosity of the soldiers' head is a trifle denser and perhaps stiffer than in *incertus*. However this difference is so vague that I dare not attribute any importance to it.

It is, therefore, not impossible that *Microtermes incertus* is met with in India; still it seems rather surprising seeing that this species is so far known only from Mozambique and Natal. However I do not believe that the resemblance of the soldiers in question with those of *M. incertus* necessarily implies the identity of both kinds. To substantiate my view I shall draw a parallel between the imagines of some African and Indian species. The winged individuals of *M. Trägårdhi* and *M. sindensis* show hardly any difference at all, and their soldiers, I think, will be very nearly alike. Again, *M. incertus* and *M. obesi* differ hardly in any other respect but the number of segments of their antennæ, there being 16 in *incertus*, 15 in *obesi*. The two species are consequently very closely related, which leads me to believe that their soldiers and workers cannot be much different either. It seems to me highly probable that the soldiers and workers before me belong to *M. obesi*, since part of them was found with *Odontotermes obesus* in the same locality as the imagines described above.

Collector's Report :—

KHANDALA, 2-6-1911.—"Termites the galleries of which were constructed in a nest of *O. obesus* form *b*." (Assmuth.)

8-6-1911.—"Under stone." (Assmuth.)

MICROCEROTERMES SECTION.

Gen. MICROCEROTERMES, Silv.

Microcerotermes Heimi, Wasm.

Tallies in all castes with co-types from WASMANN'S collection as well as with Ceylon specimens received from GREEN.

Collector's report :—

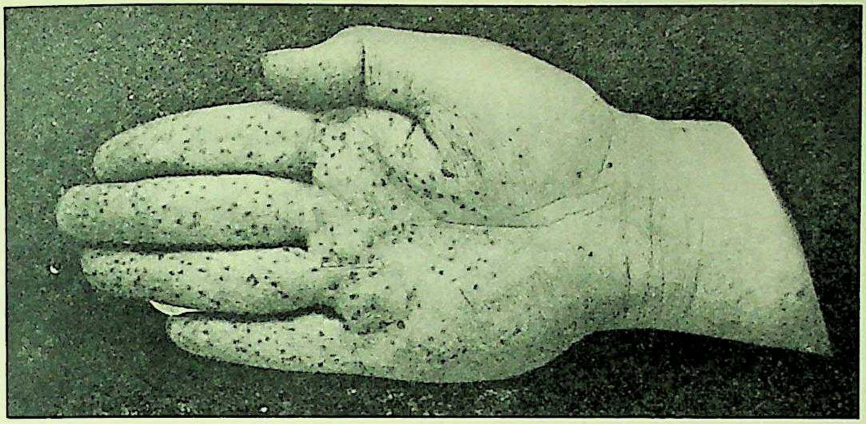
BORIVLI JUNGLE (SALSETTE ISLAND), 5-2-1911.—"Spherical nest. Proved by experiment that material of which nest is made burns well when put in fire.—I have been unable to discover any regular layers such as shown by you (HOLMGREN, 1906) to exist in South American termite-nests built of wood-carton. The nest of *Microcerotermes Heimi* which is made of extremely hard woody material, presents a pretty uniform labyrinth of small chambers which are connected by minute holes piercing the partitions, just sufficiently large to allow the termites to pass through. The outer surface is here and there covered with patches of a thin crust of reddish earthy material; the royal cell is situated rather more downwards, not in the centre. Eggs are, of course, found in greater quantities in chambers in the neighbourhood of the royal cell, but I could not convince myself that they were limited to a definite space which might rightly be termed a "zone".—Number of workers, as is always the case in this species, very great, that of soldiers rather small." (Assmuth.)

25-3-1911.—"Spherical nest of very tough woody material. Nest not perfectly spherical, but somewhat elongate. Greater axis 24-28 cm., smaller 15-20 cm. Nest built just above surface of ground on withered bamboo-stump, as is apparently the rule with this species." (Assmuth.)

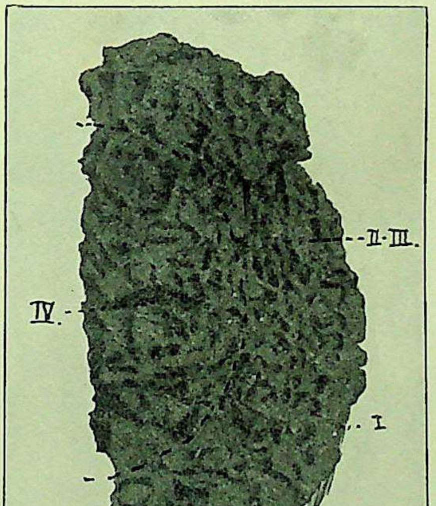
5-4-1911.—"Spherical nest. Fully developed queen in royal cell, but no king. The latter, in fact, never found in any of the many nests examined. In a number of nests of this species the royal cell was found, but no queen in it, though nest was otherwise crammed full of termites." (Assmuth.)

5-4-1911.—"Spherical nest containing double (two-storied) royal cell, the one situated above the other, both separated by simple flat partition forming ceiling of lower, and bottom of upper, cell, pierced with a fair number of small holes for passage of workers and soldiers. No fewer than 13 queens, but no king. Though queens here of different size, yet all of them smaller than those found singly in other nests. Dimensions of nest about the same as stated above." (Assmuth.)—Assmuth is right in believing that the queens are neoteinic; the species consequently belongs—together with *Armitermes neotenicus*, Holmg.—to those which construct special chambers for the neoteinic individuals.

Note.—The build of *Microcerotermes* nests might perhaps be taken as a proof that they have followed a line of development different from that of the *Eutermes*-nests of South America which I have described. The study of portions of nests of *M. papuanus* and *M. Biroi* from New Guinea, which I made some time ago, convinced me that such was the case. This fact can not be surprising, since *Microcerotermes*, morphologically, belongs to quite another line of descent than *Eutermes*; and, as a matter of fact,



VII.—HAND COVERED WITH BROWN SPECKS FROM BITES OF SOLDIERS OF *Odontotermes brunneus* HAG.



VIII.—SECTION THROUGH PART OF NEST OF *Microcerotermes Heimi* WASM.
I—Coating zone; II and III—Outer zone (not differentiated);
IV—Nursery zone (central zone absent).

TERMITES FROM BRITISH INDIA.

the portions of the nests just mentioned do not show an arrangement in layers analogous to what we observe in *Eutermes*-nests. This being the case, it would be highly remarkable if a *Microcerotermes*-nest was really discovered in which an arrangement in layers or zones similar to that of *Eutermes*-nests could be shown to exist; for the practice of building such a type of nest would doubtlessly be the result of parallel lines of development.

Now Assmuth has sent me two portions of the second nest mentioned above (see collector's report); one of the fragments—the more interesting of the two—a piece 7·5 cm. thick, is taken from the outer part of the nest, the other is the innermost portion of it with the royal cell. To my surprise I recognise in the first fragment a distinct stratification, *viz.* 1. A coating zone (zone I; cp. HOLMGREN, Studien ueber suedamerikanische Termiten, 1906), consisting of very minute pellets of earthy material, the exterior of which is not smoothed. The zone is irregularly rough and warty, forming the outside wall of the external layer of cells or chambers. 2. An outer zone (zone II and III). This layer contrasts with the interior of the nest by its very colour, its walls being lined with a sort of brownish-black coating of excrements, whereas the walls of the interior are lined yellowish-brown. Moreover, the chambers of this zone are, on the whole, smaller than those of the interior. They also seem to extend in a more tangential direction, at least in the lower portions of the zone in question. The latter is not built regularly, nor is the form of its cells well definable in all parts; but the colour of its interior lining enables us to fix its limits without any difficulty. The thickness of the layer is about 3 cm. 3. A nursery zone (zone IV.) Its walls are lined with a yellowish-brown coating. The chambers, though very irregular, show a more or less marked horizontal position. Round the royal cell their arrangement appears to be somewhat concentric, but without any regularity. The queen is found in this layer in a big (3-4 cm. broad) rather flat-roofed chamber with perforated walls. A central zone (Zentralkern) would, therefore, seem to be absent.

The general build of the nest appears from the accompanying photograph (No. 8).

Hence I am of opinion that, in the case of the *Microcerotermes*-nest under discussion, a stratification has been proved to exist which is substantially the same as in the nests of the *Syntermes*-*Eutermes*-section. It may well be supposed that such a conformity goes back to primeval conditions, and hence it is likewise conceivable that the case before us is the expression of instincts of nest-building which had been developed even in the *Mesotermitidæ*. But when we examine the construction of nests of the *Mesotermitidæ* as it appears to-day, we find concentric nests only in the *Coptotermitinæ*, a subfamily which can nowise be considered as the starting point of development either for the *Syntermes*—or the *Microcerotermes*-section. Our present knowledge of the *Mesotermitidæ*, then, proves that neither for *Eutermes*—nor *Microcerotermes*-nests a common form of concentric nests can be pointed out as the primitive type. Consequently we must for the time being assume that the conformity of stratification in the nests of the above-named sections is based on parallel development of the instincts of nest-building.

HAMITERMES SECTION.

Gen. HAMITERMES, Silv.

Subgen. SYNHAMITERMES, n. subg.

Hamitermes (Synhamitermes) quadriceps, Wasm.

I have before me both soldiers and workers.

Collector's Report :—

KHANDALA, 31-5-1911.—"Termites the flat broad tunnels of which were constructed in the pillars of a nest of *O. obesus* form c." (Assmuth.)

Note.—The new subgenus *Synhamitermes* will be defined later on in my "Termitenstudien." I include in it, together with *H. quadriceps*, *H. brevicorniger* from South America.

MIROTERMES SECTION.

Gen. CAPRITERMES, Wasm.

Capritermes incola, Wasm.

Soldiers as well as workers are in my possession; they do not differ from Ceylonese specimens.

Collector's Report :—

KHANDALA, 22-5-1911.—"Tunnels in pillars of nest of *O. obesus* form *a*." (Assmuth.)

10-6-1911.—"Under stone." (Assmuth.)

SYNTERMES SECTION.

Gen. EUTERMES, Fr. Mueller.

Eutermes biformis, Wasm.

Tallies perfectly with specimens from Ceylon.

Collector's Report :—

BORIVLI JUNGLE (SALSETTE ISLAND), 5-4-1911.—"In small galleries built on surface of bare ground." (Assmuth.)

KHANDALA, 4-5-1911.—"Under broad stone on top of mountain, approximately 2,700 feet above level of sea. Inner walls of tunnels as well as lower side of stone with deep-black grained surface, like shagreened leather." (Assmuth.)

4-5-1911.—"Nest near preceding one, under stone. The whole mountain (Fernhills) apparently occupied by this species; I found the termites under nearly every stone I turned." (Assmuth.)

29-5-1911.—"Under stone in deep ravine." (Assmuth.)

29-5-1911.—"Under stone not far from preceding nest." (Assmuth.)

2-6-1911.—"Nest under stone. This is the only case in which I observed a *Eutermes*-nest having some sort of overground structure—a clod of dry mud beside stone covering main nest was traversed by numerous black-coated galleries so characteristic of *Eutermes biformis*. The clod was about 10 cm. high and had a surface diameter of 20-30 cm." (Assmuth.)

2-6-1911.—"Under stone close by preceding nest." (Assmuth.)

Note.—Previously known from Ceylon as well as Bombay.

(*To be continued.*)

A MONOGRAPH OF THE WASPS OF THE GENUS *CERCERIS* INHABITING BRITISH INDIA.

WITH NOTES ON OTHER ASIATIC SPECIES.

BY

ROWLAND E. TURNER, F.Z.S., F.E.S.

(Continued from page 516 of this Volume.)

PART II.

(With Plates C & D.)

Cerceris pruinosa Morice.

Cerceris pruinosa Morice Trans. Ent. Soc. London, p. 303, 1897. ♀.

♀. Pallide flava, vertice mesonotoque nigro-maculatis; flagello segmentisque abdominalibus apice anguste ferrugineis; clypeo dimidio apicali subconcavo, angulis producto; segmento ventrali secundo area basali elevata lata; segmento mediano area basali nitida.

Long. 10 mm.

♀. Clypeus about half as broad again at the apex as long, the apical half subconcavely depressed, widely and shallowly emarginate on the apical margin and produced at the angles. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, second joint of the flagellum scarcely longer than the third. Posterior ocelli as far from the eyes as from each other. Pronotum depressed in the middle; mesopleuræ without tubercles. First abdominal segment broader than long; the raised area at the base of the second ventral segment broad; pygidial area ovate, much broader at the base than at the apex. Shallowly and sparsely punctured on the dorsal surface of the thorax, more closely and deeply elsewhere; the enclosed area at the base of the median segment smooth, but not highly polished, with a median groove. Fifth ventral segment widely emarginate at the apex. Wings hyaline; first recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Quetta (*Nurse*). July.

Originally described from Abbasiyeh in Egypt; also taken by Mr. Eaton at Biskra, Algeria.

Cerceris spectabilis Rad.

Cerceris spectabilis Rad. Horæ Soc. Ent. Ross. XX, p. 36, 1886.

♀. Flava; abdomine incisuris ferrugineis; flagello testaceo; vertice, mesonoto, areaque basali segmenti mediani nigris; clypeo supra dimidium apicalem subimpresso, apice truncato, mesopleuris tuberculo acuto, segmento ventrali secundo area basali haud valde elevata, segmento mediano area basali nitido ; alis hyalinis, apice leviter infumatis.

♂. Feminæ similis ; abdomine incisuris nigris, clypeo latitudine fere sesqui longiore, apice truncato.

Long. ♀ 7 mm., ♂ 6 mm.

♀. Clypeus flattened or feebly impressed from before the middle to the apex, the apical margin broadly truncate. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli further from the eyes than from each other, the eyes slightly divergent towards the clypeus. Mesopleuræ with an acute tubercle ; first abdominal segment as long as broad ; second ventral segment with a feebly raised area at the base. Pygidial area nearly twice as long as the greatest breadth, rounded at the apex, the sides almost parallel. Head and thorax finely and sparsely punctured ; the enclosed area at the base of the median segment shining, divided by a longitudinal groove ; the sides of the median segment, mesopleuræ and abdomen coarsely and rather closely punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus nearly half as long again as broad, truncate at the apex : mesopleuræ without a spine ; first abdominal segment longer than broad ; pygidial area nearly half as long again as broad.

Habitat.—Quetta (*Nurse*). July.

Cerceris pulchella Klug.

Cerceris pulchella Klug. Symb. Physic., 1845. ♂ ; Schlett. Zool, Jahrb, II, p. 391, 1887. ♂, ♀.

♀. Flava, macula circa ocellos, mesonotoque nigris ; flagello, pygidio, segmentisque dorsalibus basi pallide ferrugineis ; alis hyalinis, apice infuscatis ; clypeo convexo, apicem versus triangulariter truncato, mesopleuris tuberculatis, segmento ventrali secundo area basali elevata, area basali segmenti mediani nitida.

Long. 10 mm.

♂. Flavus, vertice, mesonoto, area basali segmenti mediani, segmentisque abdominalibus basi nigris ; flagello pallide ferrugineo ; clypeo latitudine sesqui longiore, apice truncato.

♀. Clypeus convex, with a small oblique triangular truncation at the apex, the middle lobe as long as broad and truncate at the apex. Antennæ inserted high up on the front, as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Cheeks not quite as broad as the greatest breadth of the eye. Mesopleuræ with a distinct tubercle ; first abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area pyriform, much narrowed at the apex. Head and thorax finely punctured, thorax and median segment shining and very sparsely punctured; the triangular area at the base of the median segment smooth and shining, with a shallow median groove; abdomen more strongly punctured. First recurrent nervure received just beyond one-third from the base of the second cubital cell.

♂. Middle lobe of the clypeus about half as long again as broad, truncate at the apex, slightly convex. Antennæ inserted a little nearer to the anterior ocellus than to the base of the clypeus. First abdominal segment longer than broad by about one quarter; pygidial area as broad at the base as long, narrowed to the apex, where it is not more than two-thirds of the breadth at the base, the apical margin truncate. More strongly punctured than the female, especially on the thorax and median segment; the triangular area at the base of the median segment as in the female. The first recurrent nervure is received just before one-third from the base of the second cubital cell.

Habitat.—Quetta (*Nurse*).

Originally described from Egypt.

I feel confident that this is the species described as *pulchella* by Schletterer, but do not consider that his identification is beyond doubt. A specimen in the Oxford University Museum, collected by Captain Boys, seems to be identical in structure and sculpture but differs remarkably in colour; the ground colour being black without any ferruginous markings, and the yellow bands on the abdomen are reduced in size and differ in shape.

Cerceris dentata Cam.

Cerceris dentata Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 260, 1890. ♀.

♀. Nigra; clypeo, fronte, scapo, macula pone oculos, pronoto, tegulis, mesopleuris macula, scutello utrinque, postscutello, segmento mediano linea lata utrinque, segmento abdominali primo macula parva utrinque, segmentis secundo tertioque fascia angusta apicali, quinto fascia lata tibiis tarsisque flavis; segmento abdominali primo femoribusque ferrugineis; alis hyalinis, apice vix infumatis; clypeo concavo, apice late truncato; mesopleuris dentibus binis approximatis armatis; segmento mediano area basali nitida, sparsissime punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broad, concave on the apical two-thirds, broadly truncate at the apex. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum more than half as long again as the third. Eyes diverging very slightly towards the clypeus; posterior ocelli a little further from the eyes than from each other, and further from the posterior margin of the head than from the eyes. Mesopleuræ with two stout teeth placed close together; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex; pygidial area ovate, twice as long as the greatest breadth. Rather deeply punctured; more closely and finely on the head; enclosed area at the base of the median segment smooth and shining, with very few large punctures and a well marked median groove. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Barrackpore (*Rothney*). According to Bingham also from Poona.

Cerceris quettaensis Cam.

Cerceris quettaensis Cam. Ann. and Mag. Nat. Hist. XX., p. 85., 1907.

♀. Nigra; clypeo, fronte, scapo, macula post oculos, rapronoto utrinque, mesopleuris maculis duabus, tegulis, postscutello, segmento mediano utrinque pedibus, segmento secundo dorsali fascia basali tertio quintoque fere totis, quarto fascia antice late emarginata, segmentisque ventralibus 2-5 flavis; clypeo dimidio apicali impresso, apice truncato; mesopleuris spinis duobus acutis; segmento mediano area basali nitido; alis hyalinis, apice leviter infuscatis; segmento ventrali secundo area basali elevata.

Long. 13 mm.

♂. Feminæ similis; clypeo latitudine paullo longiore, apice truncato, mesopleuris tuberculatis.

Long. 12 mm.

♀. Clypeus a little broader than long, broadly truncate at the apex, the apical half very slightly concave. Antennæ inserted fully half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum nearly half as long again as the third. Mesopleurae with two acute spines; first abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area broadest at the base, half as long again as the greatest breadth, rather narrowly rounded at the apex. Coarsely punctured, the space at the base of the median segment smooth and shining, with very short striæ at the sides, divided by a deep longitudinal groove. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus a little longer than broad, truncate at the apex. Antennæ inserted as far from the base of the clypeus as from the anterior ocellus, the apical joint not curved and no longer than the penultimate. Mesopleuræ with two tubercles, the posterior one acute, but not as long as in the female. First abdominal segment longer than broad.

Habitat.—Quetta (*Nurse*). May.

Cerceris comberi sp. n.

♀. Flava; vertice, mesonoto, areaque triangulari segmenti median nigris; flagello, segmento dorsali primo, secundo apice quartoque basi rufis alis leviter infuscatis; clypeo apice fere transverso, ante apicem transverse impresso, segmento ventrali secundo area basali elevata.

Long. 12 mm.

Clypeus concave, broadly truncate or subemarginate at the apex, with a transverse depressed line before the apex. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the third joint of the flagellum as long as the second. Head broad, the cheeks broader than the greatest breadth of the eyes, without a spine. Eyes diverging towards the clypeus. Pronotum not depressed in the middle, the posterior angles prominent; mesopleuræ without spines. First abdominal segment almost quadrate, second ventral segment with a small raised area at the base; fifth ventral segment raised broadly on the apical margin, with a deep depression before the raised space; pygidial area broad, less than twice as long as the greatest breadth, slightly broadened to the middle and rather broadly truncate at the apex. Closely but not very deeply punctured; the enclosed area at the base of the median segment obliquely striated at the sides, almost smooth in the middle, the median groove broad and transversely striated. First recurrent nervure received a little before the middle of the second cubital cell.

Yellow; the vertex, ocellar region, mesonotum, extreme apex of the scutellum and the enclosed area at the base of the median segment black; an oblique yellow band on each side on the vertex; flagellum, first dorsal segment, apex of second segment broadly and the base of the fourth segment more obscurely pale rufo-ferruginous. Wings dusky fulvo-hyaline stained with fuscous at the apex.

♂. The ferruginous colour on the second and fourth dorsal segments is replaced by black, which is sometimes also the case in the female; the clypeus is longer than broad, convex at the base, truncate at the apex; first abdominal segment nearly twice as long as broad.

Habitat.—Karachi (*Comber*). October. Mysoore (sic) Oxford University Museum, ex. coll. Westwood.

This seems to be very near *histrionica* Klug, but the petiole of the male is longer in the present species according to Klug's figure.

Cerceris albopicta Sm.

Cerceris albopicta Sm. Ann. & Mag. Nat. Hist. (4) XII, p. 412, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, mesopleuris maculis duabus, segmento dorsali secundo basi macula utrinque, ventrali macula utrinque apice, segmentis tertio quintoque fascia apicali emarginata, pedibusque albidis; flagello segmentisque abdominalibus

1—3 ferrugineis; alis hyalinis, apice infumatis; clypeo plano, apice late truncato, mesopleuris haud tuberculatis; segmento mediano area basali nitida, lateribus breviter oblique striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; segmento abdominali primo solo ferrugineo; clypeo apice truncato, convexo; segmento mediano area basali lateribus punctata vel striata.

Long. ♀, 11-14 mm.; ♂, 9 mm.

♀. Middle lobe of the clypeus about half as broad again at the apex as long, flat, the apex broadly truncate and very slightly porrect. Antennæ inserted almost as near to the anterior ocellus as to the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes distinctly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex, depressed at the base; pygidial area elongate ovate, narrowly truncate at the apex, twice as broad at the base as at the apex and about twice as long as the greatest breadth. Closely punctured, more deeply on the abdomen than on the thorax, median segment and mesopleuræ rugose; enclosed area at the base of the median segment smooth and shining, with short oblique striæ on the sides, the median groove transversely striated. First recurrent nervure received just before the middle of the second cubital cell.

♂. Clypeus longer than broad, truncate at the apex. Apical joint of the flagellum shorter than the penultimate, very slightly curved. Enclosed area at the base of the median segment smooth and shining, often with a few punctures or striæ at the sides; first abdominal segment much longer than broad; the raised area at the base of the second ventral segment distinct; pygidial area longer than broad, a little broader at the base than at the apex; first recurrent nervure received close to the base of the second cubital cell. Second ventral segment evenly punctured in both sexes.

Habitat.—W. India; Bombay to Quetta.

This is one of the few Indian species found at Quetta.

Cerceris wickwari sp. n.

♀. Nigra, clypeo, fronte, prothorace macula utrinque, segmento abdominalibus tertio quintoque fascia apicali, tegulis, tibiis tarsisque flavis; segmento abdominali primo rufo; clypeo subconcavo, apice truncato, segmento ventrali secundo area basali elevata, segmento mediano area basali punctata, in angulis striata.

Long. 9 mm.

♂. Feminæ similis; clypeo apice truncato, convexo.

♀. Clypeus concave on the apical half, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, the second joint of the flagellum equal to the third. Cheeks a little more than half as broad as the eyes. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ without spines. Basal abdominal, segment a little longer than broad, constricted at the apex. Second ventral segment with a raised area at the base; pygidial area elongate ovate, narrowly truncate at the apex. Strongly punctured, more closely on the head than elsewhere; the enclosed area at the base of the median segment punctured, obliquely striated in the angles and at the apex, with a deep median groove. First recurrent nervure received at one-fifth from the base of the 2nd cubital cell. Black; mandibles, except at the apex, clypeus, front, a spot on each side of the pronotum, tegulæ, a small spot at the anterior angles of the scutellum, a narrow apical band on the third dorsal abdominal segment, another on the fifth, the whole of the third ventral segment, a spot on each side of the fifth, tibiæ and tarsi yellow; first abdominal segment and second ventral segment ferruginous red, antennæ testaceous brown, the scape yellow beneath. Wings hyaline, with a very faint fuscous cloud at the apex, nervures testaceous.

♂. As in the female; but the clypeus is longer than broad, narrowly truncate at the apex; the pygidial area very small, coarsely punctured, truncate at the apex, twice as long as the greatest breadth, very slightly narrowed towards the apex.

Habitat.—Ceylon, Colombo (*Wickwar*). July to September, March to April.

In structure this resembles the last species (*allopicta*), but the second ventral segment is not evenly punctured, being almost smooth at the apex. The size and colour are also different.

Cerceris rybiensis Linn.

Sphex rybiensis Linn. Pand and Flora Rybijensis, p. 8, 1771.

Cerceris rybiensis Schlott. Zool. Jahrb. II, p. 375, 1887.

Cerceris kashmirensis Nurse Ann. and Mag. Nat. Hist. (7) XI., p. 524, 1903.

♀. Nigra; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento abdominali secundo basi, tertio, quarto quintoque fascia apicali antice emarginata flavis, antennis ferrugineis vel nigris, pedibus testaceis flavo-variegatis; clypeo apice truncato, supra dimidium apicalem impresso; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata; segmento mediano area basali in angulis striata; alis subhyalinis, nervulis fuscis vel testaceis.

♂. Feminæ similis; clypeo apice anguste truncato, latitudine longiore.

Long. ♀, 12 mm.; ♂, 9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, a concave depression reaching from the apex to beyond the middle, the apical margin slightly recurved. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes slightly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment broader than long; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the apex. Closely and rather coarsely punctured; the enclosed area at the base of the median segment opaque, striated in the corners and divided by a median groove. First recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus longer than broad, rather narrowly truncate at the apex. First abdominal segment longer than broad.

Habitat.—Kashmir 5—6,000 ft. (*Nurse*). May and June. Simla (*Nurse*). August and September.

The male from Simla has the apex of the clypeus black. *C. fortinata* Cam. is very near this species.

Cerceris fortinata Cam.

Cerceris fortinata Cam. Ann. and Mag. Nat. Hist. X., p. 57, 1902. ♂.

Cerceris unifasciata Bingh. ♀ (nec ♂, nec Smith), Fauna Brit. India. Hym. I., p. 310, 1897.

Cerceris aureobarba Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 221, 1905. ♂.

♀. Nigra; clypeo et fronte flavis; pronoto utrinque, tegulis, postscutello, tibiis, tarsis, segmentis dorsalibus tertio quintoque fascia apicali ochraceis; clypeo apice truncato, dimidio apicali plano; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elavata.

Long. 9—12 mm.

♂. Feminæ similis; clypeo convexo, apice truncato, margine apicali late nigro.

Long. 8—9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, the apical half flattened, but not concave. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum only slightly longer than the third. Eyes parallel on the inner margin, posterior ocelli nearly twice as far from the eyes as from each other. Pronotum not impressed in the middle; mesopleuræ without tubercles: first abdominal segment longer than broad; second ventral segment with a raised area at the base; pygidial area ovate, much broader at the base than at the apex, very narrowly truncate at the apex, granulate. Closely and deeply punctured, the enclosed area at the base of the median segment longitudinally striated, divided by a longitudinal groove. First recurrent nervure received at one-quarter from the base of the second cubital cell. Wings hyaline, strongly clouded with fuscous at the apex and in the radial cell.

♂. Clypeus longer than broad, convex and truncate at the apex. Apical joint of the flagellum not curved, shorter than the penultimate. First recurrent nervure received nearer to the base of the second cubital cell than in the female.

Habitat.—Northern India and Burma.

Bingham has taken his description of *unifasciata* from Smith's type, which came from North China and is not identical with the Indian species for which Cameron's name must stand. Bingham's short description of the female is apparently taken from an Indian specimen of the present species. The form of the clypeus in the male is quite different in the two species. I do not know that true *unifasciata* occurs in India. *C. aureobarba* Cam. is undoubtedly a synonym, and must sink, as is the case with most of the species of *Cerceris* described in the same paper.

Cerceris emarginata Panz.

Philanthus emarginatus Panz. Faun. Insect. German. VI, 1799.

Cerceris emarginata Spin. Insect. Ligur, I., p. 97, 1806.

♀. Nigra, clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, segmento mediano macula parva utrinque, pedibus, segmento dorsali secundo basi, tertio, quarto, quintoque late flavis; alis hyalinis apice infuscatis; clypeo latitudine longiore, parte apicali depresso, apice truncato, segmento ventrali secundo area basali elevata; segmento mediano area basali basi longitudinaliter striata.

♂. Feminæ similis; segmento sexto flavo-fasciato, clypeo latitudine fere duplo longiore, apice truncato.

Long. ♀ 9 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the apical half depressed, broadly truncate at the apex. Second joint of the flagellum longer than the third; mesopleuræ not tuberculate; first abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area elongate ovate, nearly twice as broad at the base as at the apex. Strongly and closely punctured; the enclosed area at the base of the median segment longitudinally striated at the base, finely punctured at the apex, with a deep median groove.

The abdominal yellow fasciæ are not emarginate anteriorly.

Habitat.—Quetta (*Nurse*). May. Pishin (*Nurse*). April.

This common species is found throughout Central and Southern Europe and Turkestan.

Cerceris compta sp. n.

♀. Nigra; flagello subtus testaceo; segmento abdominali primo rufo-ferrugineo; clypeo, fronte, scapo, pronoto, tegulis, mesopleuris, scutello, postscutello, segmento mediano utrinque plus minus maculato, segmento dorsali secundo dimidio basali, tertio antice emarginato, quinto, ventralibus 2—5, pedibusque flavis; alis hyalinis, apice vix infumatis; clypeo basi modice convexo, dimidio apicali leviter impresso, apice late truncato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, lateribus punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broadly truncate at the apex; a little convex at the base, the apical half slightly impressed. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum nearly half as long again as the third. Eyes parallel; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment about as broad at the base as long, narrowed at the apex; second ventral segment with a raised area at the base; pygidial area ovate, narrower at the apex than at the base, rather more than half as long again as the greatest breadth. Closely but not coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove, sometimes with a few punctures on the sides. First recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Karachi (*Comber*). October.

In colour this resembles *rufo-nodis* Rad., which has been given, whether rightly or not I do not know, as a synonym of *rubida* Jur. The scheme of colouring seems to be common to several species in Western Asia, and the present species is undoubtedly distinct from *rubida*.

Cerceris protea sp. n.

Cerceris protea Nurse m. s.

♂. Nigra; clypeo, fronte, scapo, genis, pronoto, tegulis, mesopleuries, scutello, postscutello, segmento mediano utrinque, segmento secundo basi, tertio macula nigra basali quarto quintoque fascia lata emarginata, pedibusque flavis; segmento primo, flagelloque ferrugineis; alis hyalinis, apice infuscatis; clypeo plano, apice late truncato; mesopleuris haud dentatis; segmento mediano area basali nitida, lateribus obscure striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; genis nigris, flavomaculatis; clypeo latitudine longiore, apice truncato.

Long. ♀, 10 mm; ♂, 7-9 mm.

♀. Clypeus flat, as broad at the apex as long, the apical margin straight. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum no longer than the third. Eyes very slightly divergent towards the clypeus; posterior ocelli as far from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment slightly broader than long; second ventral segment with a raised area at the base; pygidial area narrow, elongate ovate, about three times as long as the greatest breadth, narrowly rounded at the apex. First recurrent nervure received at about one-quarter from the base of the second cubital cell. Closely and not very coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with short, obscure striæ on the sides, the median groove transversely striated.

♂. Clypeus truncate at the apex, longer than broad; apical joint of the flagellum shorter than the penultimate, not curved; first abdominal segment as in the female; pygidial area about half as long again as broad, the sides almost parallel.

Habitat.—Deesa and Abu (*Nurse*).

Cerceris novaræ Sauss.

?. *Cerceris pictiventris* Dahlb. Hymen. Europ. I., p. 498, 1845; Bingh. Fauna Brit. India Hym. I., p. 305, 1897.

Cerceris novaræ Sauss. Reise d. Novara Zool. II, p. 92, 1867. ♀; Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 257, 1890. ♂ ♀.

Cerceris fervens Sm. Ann. Mag. Nat. Hist. (4) XII, p. 411, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, mesopleuris macula magna, segmento mediano macula magna utrinque, segmento secundo dorsali basi, tertio quintoque fascia apicali late emarginata, segmentis ventralibus 2-5, pedibusque flavis, clypeo plano, latitudine longiore, apice truncato, mesopleuris haud tuberculatis; segmento mediano area basali nitida, apice rugose striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminæ similis; clypeo apice late rotundato; mesopleuris haud flavopictis; segmentis ventralibus 4-6 nigris.

Long. ♀, 9-11 mm.; ♂, 8-10 mm.

♀. Clypeus a little longer than broad, flattened in the middle and truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes almost parallel, very slightly divergent towards the clypeus, posterior ocelli a little further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the apex, twice as long as the greatest breadth. Coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a broad, transversely striated median groove, and a few striations at the apex.

♂. Clypeus very broadly rounded at the apex, almost truncate, slightly convex. Antennæ inserted as near to the anterior ocellus as to the base of the clypeus, the apical joint no longer than the penultimate, not curved. Pygidial area about half as long again as broad.

Habitat.—The whole of India, Burma and Ceylon; but not extending beyond the eastern edge of the Rajputana desert in a North-westerly direction.

As I have not seen specimens of *pictiventris* from Java, I think it safer to use Saussure's name for this species, though it will very likely prove that it is identical with *pictiventris*. Specimens from Sarawak have the pygidial area of the female broader than in *novarae*, and the abdomen in both sexes is a little broader in proportion; these will probably prove to be nearer the typical form.

Cerceris boysi sp. n.

♀. Nigra; clypeo, fronte, scapo, pronoto in medio interrupto, tegulis, macula pone oculos, mesopleuris macula, scutello, postscutello, segmento midiano macula apicali utrinque, segmentis dorsalibus 2-3, macula transversa magna utrinque, ventralibus 2-3 fascia lata, dorsalibus 4-5 fascia apicali, pedibusque eburneis; alis hyalinis, apice infumatis; stigmate testaceo; clypeo subquadrato, apice truncato, dentibus binis minutissimis armato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata.

Long. 6 mm.

♀. Clypeus slightly convex, as long as broad, truncate at the apex, with a very minute tooth on each side. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum half as long again as the third. Eyes parallel, posterior ocelli half as far again from the eyes as from each other. Pronotum slightly depressed in the middle; mesopleuræ without tubercles; first abdominal segment subquadrate; second ventral segment with a raised area at the base; pygidial area ovate, broader at the base than at the apex, nearly twice as long as the greatest breadth and narrowly truncate at the apex. Punctured, coarsely, but not very closely on the abdomen, more finely on the head and thorax; the enclosed area at the base of the median segment smooth, with one or two large punctures and a deep median groove. First recurrent nervure received at one-sixth from the base of the second cubital cell.

Habitat.—India (*Boys*).

Type in Oxford University Museum ex coll. Westwood.

Captain Boys collected in the Almora and other North-Western hill districts.

Cerceris instabilis Sm.

Cerceris instabilis Sm. Cat. Hym. B. M. IV, p. 452, 1856. ♀.

Cerceris velox Sm. Trans. Ent. Soc. London, p. 41, 1875, ♂.

♀. Ferruginea; vertice mesothoraceque nigris; clypeo, fronte, scapo, vertice linea curvata, pronoto, scutello, postscutello, segmento mediano utrinque, segmento dorsali secundo basi, tertio quintoque totis flavis; alis hyalinis, apice valde infuscatis; clypeo apice emarginato angulis dentatis: mesopleuris haud tuberculatis; segmento ventrali secundo area basali minime elevata.

♂. Niger; maculis flavis ut in femina dispositis; segmento abdominali primo, secundo, tertioque apice ferrugineis; clypeo apice late rotundato, minutissime quadridentato.

Long. ♀, 9—11mm. ♂, 8—10 mm.

♀. Clypeus broader than long, rather widely emarginate at the apex, with a broad and slightly porrect tooth on each side at the angles of the emargination. Antennæ inserted less than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes parallel on the inner margins, posterior ocelli half as far again from the eyes as from each other. First abdominal segment distinctly longer than broad; second ventral segment with the raised area at the base not very distinct; pygidial area rugose, narrowed from the base, about half as broad again at the base as at the apex. Closely, but not deeply, punctured; the enclosed area at the base of the median segment longitudinally striated.

♂. Clypeus nearly as broad as long, very broadly rounded at the apex and armed with four minute teeth. First abdominal segment nearly twice as long as broad; the area at the base of the second ventral segment more strongly raised than in the female. More deeply punctured than in the female, the enclosed area at the base of the median segment punctured and more or less longitudinally striated. Pygidial area a little longer than broad, the sides almost parallel.

Habitat.—Burma, Ceylon, and the whole of India, except the extreme North-west.

Apparently not as common in the hills as on the plains, but I have taken it at 6,000 ft. in the Khasi Hills. The colour is very variable.

Cerceris bifasciata Guér.

Cerceris bifasciata Guér. Cuv. Iconog. Regn. Anim. Insectes, p. 443, 1829-1844, Pl. 71. fig. 9.

I cannot identify the species; the figure is a tolerable representation of *C. fortinata* Cam., but does not agree with the description, which seems to point to a variety of *C. instabilis* Sm. "Entiérement fauve, ponctué, avec le devant de la tete, au-dessous de l'insertion des antennes, le premier article de celles-ci, la base des mandibules et les troisieme et cinquieme anneaux de l'abdomen jaunes. Ailes un peu teintees de jaunatre avec une petite tache brune au bout.

L. 5 mil. *Hab.* le Bengale."

The length given on the plate is 10 mm.

On the whole I think there can be little doubt that the name should apply to *C. instabilis* Sm., over which it has priority.

Cerceris abuensis sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo basi, tertio fascia apicali late emarginata, quinto macula apicali, segmento ventrali tertio utrinque, tibiis tarsisque albidis: segmento abdominali primo, segmento ventrali secundo, femoribusque ferrugineis; flagello subtus fusco-ferrugineo; clypeo subconvexo, margine apicali late truncato, dentibus duobus medianis armato; mesopleuris haud tuberculatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminæ similis; segmento dorsali quinto immaculato, segmento sexto fascia late flavida; clypeo latitudine longiore, apice subtruncato; segmento ventrali secundo area basali minime elevata; segmento ventrali sexto utrinque dente armato.

Long. ♀, 8 mm.; ♂, 9 mm.

♀. Clypeus much broader than long, coarsely punctured, broadly truncate at the apex, with a narrow and shallow incision in the middle of the apical margin, the angles of the incision produced into short, blunt teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about half as long again as the third. Eyes parallel; posterior ocelli a little further from the eyes than from each other. Pronotum not depressed in the middle; mesopleuræ without tubercles; first abdominal segment as long as broad, narrowed at the apex; second ventral segment with a rather feebly raised basal area; pygidial area small, twice as broad at the base as at the apex, gradually narrowed, less than twice as long as the breadth at the base. Closely and deeply, but not very coarsely punctured; the enclosed area at the base of the median segment coarsely obliquely striated on the basal half, indistinctly striated at the apex, the median groove indistinct.

♂. Clypeus longer than broad convex; the apical margin almost transverse, narrowly depressed, with four raised carinæ on the depressed margin simulating teeth. Apical joint of the flagellum shorter than the penultimate, slightly curved. First abdominal segment about twice as long as broad; the raised area at the base of the second ventral segment not clearly defined. Sixth ventral segment with a short acute spine on each side at the apical angles. Pygidial area coarsely punctured, narrowed at the base, truncate at the apex, half as long again as the greatest breadth. The striæ on the enclosed area at the base of the median segment are longitudinal and very coarse.

Habitat.—Mount Abu (*Nurse*).

In colour this resembles *C. albopicta* Sm.

Cerceris belli sp. n.

♀. Nigra; segmento primo abdominali rufo-ferrugineo; flagello subtus testaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento secundo dorsali macula basali et apice late utrinque, segmento tertio fascia late interrupta, quarto macula utrinque, quinto fascia late emarginata pedibusque flavis; alis hyalinis, apice infuscatis; clypeo apice porrecto, late angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali minime elevata.

Long. 7 mm.

♀. Clypeus convex, porrect at the apex, the margin widely triangularly incised, the angles of the incision slightly produced and almost forming teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum less than half as long again as the third. Eyes almost parallel; posterior ocelli a little further from the eyes than from each other. Pronotum, not depressed in the middle, rounded at the angles; mesopleuræ without tubercles. First abdominal segment a little broader than long; second ventral segment with a very indistinct raised area at the base. Pygidial area closely punctured, nearly twice as long as broad, truncate at the apex, the sides parallel. Closely and rather coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Belgaum, W. India (*Bell*). July.

Cerceris pulchra Cam.

Cerceris pulchra Cam. Mem. Manch. Lit. and Phil. Soc. (4) III, p. 253, 1890. ♀ ♂.

♀. Nigra; flagello, segmentisque abdominalibus primo secundoque ferrugineis; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio basi nigro maculato, quinto, pedibusque flavis; alis hyalinis, apice infuscatis; clypeo lamina subporrecta, apicali, emarginata, sub lamina angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali punctata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; segmento dorsali secundo nigro; clypeo apice rotundato; pilis flavis ciliato.

Long. ♂ ♀, 7 mm.

♀. Clypeus flattened, the lamina slightly porrect at the apex, shallowly and very widely emarginate, the apical margin below the lamina deeply incised. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus; the second and third joints of the flagellum of equal length. Eyes parallel; posterior ocelli further from the eyes than from each other. First abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area narrow, two-and-a-half times as long as the greatest breadth, slightly narrowed to the apex. Closely and rather deeply punctured, most coarsely on the thorax; the enclosed space at the base of the median segment punctured.

♂. Clypeus rounded at the apex and fringed with yellow hairs; first abdominal segment a little longer than in the female, more than half as long again as broad, pygidial area small, a little longer than broad.

Habitat.—Bengal; Barrackpore, Nuddea (*Rothney*).

I doubt if Bingham's records of this species from Western and North-Western India are correct.

Cerceris opulenta sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto, tegulis scutello, postscutello, segmento abdominali secundo dimidio basali, tertio quintoque totis, pedibusque flavis; segmento primo rufo-ferrugineo; flagello fusco-ferrugineo; alis hyalinis, apica infuscatis, venis fuscis; clypeo lato, apice leviter porrecto, subemarginato; mesopleuris haud tuberculatis; segmento mediano area basali subnitida, in angulis striata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus twice as broad at the apex as long, the apical margin widely and shallowly emarginate and slightly porrect. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the second and third joints of the flagellum almost equal in length. Eyes parallel, the posterior ocelli almost as far from each other as from the eyes. Pronotum not depressed in the middle; mesopleuræ without tubercles. First abdominal segment distinctly longer than broad; second ventral segment with a raised area at the base. Pygidial area gradually narrowed from the base, punctured, narrowly truncate at the apex, more than three times as broad at the base as at the apex, about half as long again as the greatest breadth. Closely but not very coarsely punctured; the enclosed area at the base of the median segment smooth, obliquely striated in the corners, with very short striæ on the sides and a deep median groove. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat.—Shadipali, Sindh (*Comber*).

In addition to colour differences this species may be distinguished from *C. tristis* Cam. by the much broader pygidial area, and from *C. pulchra* Cam. by the shallower and less angular emargination of the clypeus.

Cerceris tristis Cam.

Cerceris tristis Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 255, 1890. ♀ ♂.

♀. Nigra; segmentis abdominalibus primo secundoque ferrugineis; flagello subtus testaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio macula basali nigra, quinto, tibiis tarsisque pallide flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo subconvexo, apice late emarginato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; clypeo apice anguste truncato; segmento quinto secundoque apice nigris; sexto flavo.

Long. ♀, 7 mm.; ♂, 6 mm.

♀. Clypeus much broader than long, widely and rather shallowly emarginate. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes parallel; posterior ocelli further from the eyes than from each other. Pronotum not depressed in the middle, rounded at the anterior angles; mesopleuræ without tubercles. First abdominal segment a little longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, a little more than twice as long as the greatest breadth. Closely, but not coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures, the median groove deep. First recurrent nervure received just before one-third from the base of the second cubital cell. Wings iridescent.

♂. Clypeus as long as broad, narrowed towards the apex, the margin rather narrowly truncate. Apical joint of the flagellum shorter than the penultimate, scarcely curved. First abdominal segment much longer than broad.

Habitat.—Quetta (*Nurse*). July. Deesa (*Nurse*). April. Ceylon (*Wickwar*). Barrackpore (Rothney).

Very near *rubida* Jur., but is much less coarsely punctured. It may be distinguished from *pulchra* Cam. by the less distinct raised area on the second ventral segment, and by the truncate apex of the clypeus of the male. Bingham's record of *pulchra* from N. W. Provinces may perhaps apply to this species. The typical form of *tristis* is without the ferruginous colour on the two basal abdominal segments, but the variety I have described here is the usual form. It seems to be one of the commonest Indian species, and has been confused in Rothney's collection with *C. pulchra*, which has the incision of the clypeus more angular, and is a somewhat larger species.

Cerceris melaina sp. n.

♀. Nigra ; clypeo fascia, scapo macula, pronoto macula utrinque, segmento abdominali secundo macula parva basali, tertio fascia apicali pallide flavis ; segmento primo rufo ; pedibus flavovariegatis ; clypeo lato, apice lamina libera truncata, segmento mediano area basali rugose striata, segmento ventrali secundo area basali elevata.

Long. 8 mm.

Clypeus slightly porrect, sparsely punctured, nearly twice as broad at the apex as long, the lamina free at the apex and broadly truncate. Inner margins of the eyes parallel, the breadth of the cheeks equal to rather more than half of the greatest breadth of the eyes. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum of about equal length, the interantennal carina short, conical between the antennæ and continued much lowered to the base of the clypeus. Ocelli in a very broad triangle, the posterior pair less than half as far again from the eyes as from each other. The whole insect closely and rather deeply punctured ; the triangular area at the base of the median segment coarsely obliquely rugose striate. Pronotum short, not depressed in the middle ; mesopleuræ without spines. First abdominal segment broader in the middle than long, constricted at the apex ; second ventral segment with a raised area at the base. Fifth ventral segment normal ; pygidial area pyriform, twice as long as the greatest breadth, much narrowed from the middle posteriorly and very narrowly truncate at the apex. First recurrent nervure received at one-third from the base of the second cubital cell.

Black ; a triangular spot on the inner margin of the eyes, a transverse band on the middle of the clypeus, the scape beneath, a small spot on each side of the pronotum, a spot on the tegulæ, a small spot at the base of the second dorsal segment of the abdomen, a narrow band at the apex of the third, a small spot at the apex of the fifth, and a large spot on each side of the third ventral segment pale yellow ; the legs black, irregularly variegated with yellow and ferruginous; first abdominal segment and second ventral segment ferruginous red. Wings hyaline, with a small fuscous cloud at the apex, nervures fuscous.

Habitat.—Nasik, W. India. (*Comber*).

This is very near *C. vischnu* Cam., the shape of the pygidial area and the sculpture being very similar, but the clypeus is truncate, not incised, and the petiole is feruginous. The latter distinction is of little importance, but I consider the shape of the clypeus quite sufficient for specific distinction.

Cerceris vischnu Cam.

Cerceris vischnu Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 254, 1890. ♀ ♂.

Cerceris dolosa Nurse Ann. and Mag. Nat. History (7) XI., p. 525, 1903.

♀. Nigra; Mandibulis basi, clypeo in medio, margine interiore oculorum late, scapo subtus, segmentis tertio quintoque fascia angusta apicali, segmento ventrali tertio fere toto, tibiis subtus tarsisque pallide flavis, flagello subtus, coxis, trochanteribus, femoribus, segmentoque ventrali secundo forrugineis, alis hyalinis, apice leviter infumatis, clypeo lamina apicali libera, apice incisa; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; clypeo apice rotundato, haud inciso.

Long. ♀ 8 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the lamina free at the apex and shallowly incised. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli almost as far from each other as from the eyes, the inner margins of the eyes parallel. Mesopleuræ without tubercles; first abdominal segment nearly as long as broad; second ventral segment with a raised area at the base; pygidial area narrow, broadest at the base, gradually narrowed to the apical margin, which is very narrowly truncate, fully twice as long as the greatest breadth. Coarsely and closely punctured, the enclosed area at the base of the median segment coarsely longitudinally striated. First recurrent nervure received close to the middle of the second cubital cell.

♂. The clypeus is without the free lamina at the apex broadly rounded on the apical margin, with two minute teeth in the middle; first abdominal segment much longer than broad; pygidial area nearly square.

Habitat.—Abu (*Nurse*). Kangra Valley, 4,500 ft. (*Dudgeon*). Oddichudan, N. Ceylon (*Wickwar*).

The type is not marked in Rothney's collection and I doubt if Bingham's description is taken from a female of this species. There is no mention of ferruginous on the basal and second abdominal segments in Cameron's description, which agrees well with *dolosa*. The male referred by Cameron to this species, and marked *fervens* by Smith in Rothney's collection, is undoubtedly *dolosa,* and I have no doubt that Cameron's description of the female is correct, and Bingham's erroneous.

Cerceris funerea Costa var. *pallidopicta* Rad.

Cerceris pallidopicta Rad. Fedtsch. Turkestan Sphegid, p. 59, 1877. ♀.

Cerceris funerea var *pallidopicta* Ed. Andrè Spec. Hym. Eur. III., p. 272, 1889.

♀. Nigra; mandibulis, clypeo, fronte, pronoto, tegulis, postscutello, segmento dorsali secundo macula apicali nigra, tertio macula basali nigra, quinto macula parva utrinque, pedibusque pallide flavis; flagello, femoribus segmentisque ventralibus primo secundoque testaceis; clypeo dimidio apicali depresso, apice late truncata; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata; segmento ventrali quinto late emarginata, angulis apicalibus dentato.

Long. 12 mm.

♀. Middle lobe of the clypeus a little longer than broad, the apical half flattened, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, second joint of the flagellum nearly half as long again as the third; the frontal carina short and low, separated by its own length from the base of the clypeus. Eyes slightly diverging towards the clypeus; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment almost quadrate; pygidial area elongate ovate, twice as long as the greatest breadth, narrower at the apex than at the base. Closely and rather coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove. Wings hyaline, with a very faint fuscous cloud at the apex.

Habitat.—Quetta (*Nurse*). June.

A single female in Colonel Nurse's collection corresponds well with the brief description and excellent figure given by Radoszkowski. The species is easily distinguished by the stout spines at the apical angles of the fifth ventral segment. The typical form of *funerea* is from S. E. Europe.

Two Fabrician species, which I have been unable to identify, doubtless belong to *Cerceris,* and are probably identical with subsequently described species; but I have not been able to consult the types, which are at Copenhagen. These are:

1. *Philanthus interstinctus* Fabr.

Philanthus interstinctus Fabr. Ent. Syst. Suppl., p. 269, 1798.

2. *Philanthus dissectus* Fabr.

Philanthus dissectus Fabr. Ent. Syst. Suppl., p. 269, 1798.

NOTES ON SOME ASIATIC SPECIES NOT OCCURRING WITHIN THE BOUNDARIES OF INDIA.

Cerceris pedetes Kohl.

Cerceris pedetes Kohl. Zool. Jahrb. II, p. 449, 1887. ♀.

Cerceris bicornuta Sm. Cat. Hym. B. M. IV, p. 455, 1856. ♀. (nec. Guèrin).

Cerceris smithii D. T. Wien entom. Zeitg. IX, p. 199, 1890.

C. bicornuta Sm. is the eastern representative of *C. ferreri*, and I think is undoubtedly identical with *C. pedetes*.

Habitat.—N. China (*Smith*); Korea (Kohl).

Cerceris lama sp. n.

♀. Nigra; capite longe nigro hirsuto; clypei lamina, margine interiore oculorum late, macula parva pone oculos, pronoto, tegulis, postscutello, segmentisque dorsalibus 1—5 fascia late apicali emarginata lacteis; alis subhyalinis, margine costali infumato, venis nigris; clypeo lamina libera, porrecta, apice truncata; mesopleuris bituberculatis: segmento mediano area basali nitida; abdomine nitido impunctato; segmento ventrali secundo area basali elevata nulla.

Long. 14 mm.

♀. Mandibles with a strong tooth on the inner margin nearer to the base than to the apex. Clypeus rather short with a prominent lamina from the base, the lamina longer than broad, slightly arched, and truncate at the apex; the apical margin of the clypeus below the lamina deeply semicircularly emarginate. Antennæ inserted low down, almost touching the base of the clypeus; the second joint of the flagellum as long as the first and third combined, the carina between the antennæ rather low. Posterior ocelli nearly twice as far from the eyes as from each other; the eyes diverging towards the clypeus; cheeks very broad, nearly half as broad again as the eyes. Mesopleuræ bituberculate, the posterior tubercle, the largest; first abdominal segment nearly twice as broad as long; the segments scarcely constricted, second ventral segment without a raised area at the base; pygidial area with parallel sides, subtruncate at the apex and about two and a half times as long as broad, the surface rugulose at the base. Head and thorax sparsely punctured; closely punctured rugulose on the front; mesopleuræ and median segment closely punctured; the enclosed area at the base of the median segment smooth and shining, with the usual median groove; abdomen smooth and shining. First recurrent nervure received at about one-quarter from the base of the second cubital cell; second close to the base of the third cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft., June 1904 (*H. J. Walton*).

Described from twelve specimens in the British Museum.

The colour of the markings is of the lacteous white characteristic of the district.

Cerceris ariadne sp. n.

♀. Nigra; mandibulis basi, femoribus apice, tibiis tarsisque rufo-testaceo; clypeo linea transversa, margine anteriore oculorum anguste, tegulis postscutello, segmentis dorsalibus 1-4 fascia transversa apicali flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo lamina libera, porrecta, apice late emarginata, mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla.

Long. 10 mm.

♀. Clypeus with the lamina porrect from the base, broader than long, widely and shallowly emarginate at the apex, the clypeus below the lamina concave, shining and truncate at the apex. Antennæ inserted low down, close to the base of the clypeus; second joint of the flagellum about half as long again as the third. Eyes almost parallel; posterior ocelli about one-quarter further from the eyes than from each other. Pronotum not depressed in the middle, mesopleuræ not tuberculate. First abdominal segment much broader than long; second ventral segment without a raised area at the base; pygidial area nearly three times as long as the greatest breadth, the sides nearly parallel from the base to beyond the middle, then rather sharply narrowed and very narrowly rounded at the apex. Shining, rather sparsely and not very deeply punctured; the enclosed space at the base of the median segment smooth and shining, with a median groove. Pubescence on the head and sides of the thorax rather long and greyish. The apical yellow bands on segments one and four are narrowly interrupted in the middle. Wings hyaline, clouded with pale fuscous on the costa; first recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft. (*H. J. Walton*); June.

Allied to *C. interrupta* Panz., but in the present species the lamina of the clypeus is free at the base and the enclosed area of the median segment is smooth.

Cerceris shelfordi sp. n.

♀. Nigra; mandibulis basi, clypeo, margine interiore oculorum latissime, carina frontali, scapo subtus, macula pone oculos, vertice maculis duabus obliquis, pronoto macula utrinque, tegulis, mesopleuris macula scutello fascia transversa, postscutello, segmento mediano fascia lata curvata utrinque, segmento dorsali primo apice, secundo fascia angusta apicali maculisque duabus basalibus, segmentis 3-5 fascia angusta apicali, 2-5 lateribus late et ventralibus utrinque flavis, oculis divergentibus; clypeo, apice lamina libera, obtuse bidentata; mesopleuris spina magna armatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata nulla; pedibus flavis.

Long. 10 mm.

♀. Head very large and broad; middle lobe of the clypeus short broader than long, the lamina free at the apex and truncate, armed with two blunt teeth; lateral lobes of the clypeus very broad, with a small tooth close to the inner margin. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum a little less than half as long again as the third. Eyes strongly diverging towards the clypeus; posterior ocelli nearly twice as far from the eyes as from each other; the cheeks a little broader than the greatest breadth of the eyes. Pronotum not depressed in the middle; mesopleuræ swollen and armed with a long, acute spine. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; the segments not strongly constricted; fifth ventral segment widely emarginate at the apex; pygidial area about twice as broad at the base as at the apex, gradually narrowed, twice as long as the greatest breadth. Head and thorax closely but not deeply punctured; the enclosed area at the base of the median segment coarsely obliquely striated, mesopleuræ very coarsely striated; abdomen subopaque, microscopically punctured. Wings subhyaline, the apex and the radial cell fuscous; nervures fuscous; first recurrent nervure received beyond one-third from the base of the second cubital cell.

Habitat.—Kuching, N. W. Borneo (*Shelford*); October.

Type in Oxford University Museum.

Nearly allied to *C. ferox* Sm., but differs in the form of the clypeus, the greater development of the spine on the mesopleuræ and the much shorter petiole.

Cerceris ferox Sm.

Cerceris ferox Sm. Cat. Hym. B. M. IV, p. 454, 1856. ♀. Bingh. Fascic Malay. Zool. I, App. p. v, 1903 ♀.

Cerceris annandalei Bingh. Fascic. Malay. Zool. I, App. p. v., 1903. ♂.

Habitat.—Sumatra; Biserat, Siamese Malaya.

I am not aware that this species occurs within the boundaries of British India; the specimen from Tenasserim in the British Museum marked by Bingham as a variety of *ferox* is quite distinct.

The species closely allied to *C. ferox* may be recognized by the following key.

1. Clypeus with the lamina broadly rounded at the apex and slightly porrect; petiole longer than broad .. .. *C. ferox* Sm.
   Sumatra and Selangor.

Clypeus with the lamina incised or bidentate at the apex ; petiole broader than long .. 2
2. Lamina of clypeus porrect at apex and incised .. .. *C. ferocior* Turn. Sarawak.
Lamina of clypeus not porrect, truncate, with two strong median teeth .. .. .. *C. shelfordi* Turn. Sarawak.

Cerceris ferocior, sp. n.

♀. C. shelfordio colore affinissima ; clypeo lamina apicali libera, porrecta, apice emarginata ; mesopleuris tuberculatis, spina minuta armatis; segmento mediano area cordata basi oblique, apice transverse striata ; segmento abdominali primo latitudine fere aequilongo.

Long. 13 mm.

♀. Head very broad, twice as broad as the thorax ; clypeus with the lamina free from a little before the apex, porrect and deeply and widely incised at the apex. Outer lobes of the clypeus very broad, with a tooth at the inner apical angle. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus ; the second joint of the flagellum nearly half as long again as the third. Eyes diverging strongly towards the clypeus ; the posterior ocelli more than twice as far from the eyes as from each other. Cheeks as broad as the greatest width of the eyes. Mesopleuræ swollen, with a minute spine. First abdominal segment nearly as long as broad, second ventral segment without a raised area at the base ; pygidial area about half as broad at the apex as at the base, gradually narrowed, a little more than twice as long as the greatest breadth. Head closely but not coarsely punctured, the front between the ocelli and the base of the antennæ longitudinally striate-rugulose ; thorax very sparsely punctured, the anterior half of the mesonotum longitudinally striated, mesopleuræ and median segment more deeply and closely punctured ; the enclosed area at the base of the median segment obliquely striated at the base, transversely at the apex, the median groove indistinct. Petiole sparsely punctured ; the remainder of the abdomen smooth ; the segments not strongly constricted.

The yellow bands on the vertex are longitudinal, not oblique, the spot behind the eye is large and curved and the band on the scutellum is interrupted. Wings hyaline, broadly fuscous on the costal margin.

Habitat.—Kuching, N. W. Borneo (*Shelford*). September. Type in Oxford University Museum.

This is nearer to *ferox* than *shelfordi*, but may be distinguished by the shape of the lamina of the clypeus, which is broadly rounded at the apex in *ferox* but deeply incised in *ferocior*. The petiole is also much longer in *ferox*, and the striation of the cordate area of the median segment is longitudinal. The markings in the three species are almost identical.

Cerceris invita sp. n.

♀. Nigra, opaca ; clypeo, mandibulis basi, margine interiore oculorum, carina frontali, pronoto utrinque, tegulis, postscutello, segmentoque abdominali secundo basi anguste flavis; scapo, flagello subtus, segmento abdominali primo, pedibusque testaceis; alis hyalinis, apice infumatis, venis testaceis; clypeo apice emarginato, angulis dentato ; mesopleuris minute bituberculatis ; segmento mediano area basali delicatissime oblique striata, segmento ventrali secundo area basali elevata nulla.

Long. 13 mm.

♀. Clypeus flat, short, rather widely emarginate at the apex, the angles of the emargination produced into broad and slightly porrect teeth. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the clypeus ; the second joint of the flagellum half as long again as the third ; the frontal carina produced into a small tubercle at the apex. Eyes diverging towards the clypeus; posterior ocelli twice as far from the eyes as from each other. Pronotum not depressed in the middle ; mesopleuræ with two minute tubercles. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base ; pygidial area finely transversely rugulose, about two and a half times as long as the breadth at the base, gradually narrowed from the base and almost pointed at the apex. Opaque, pubescent, shallowly punctured ; the enclosed area at the base of the median segment finely striated, obliquely in the angles, more indistinctly in the middle, intermixed with fine punctures, with a low median carina instead of the usual groove. First recurrent nervure received just before the middle of the second cubital cell.

Habitat.—Sumatra. Type in Oxford University Museum, ex coll. Westwood.

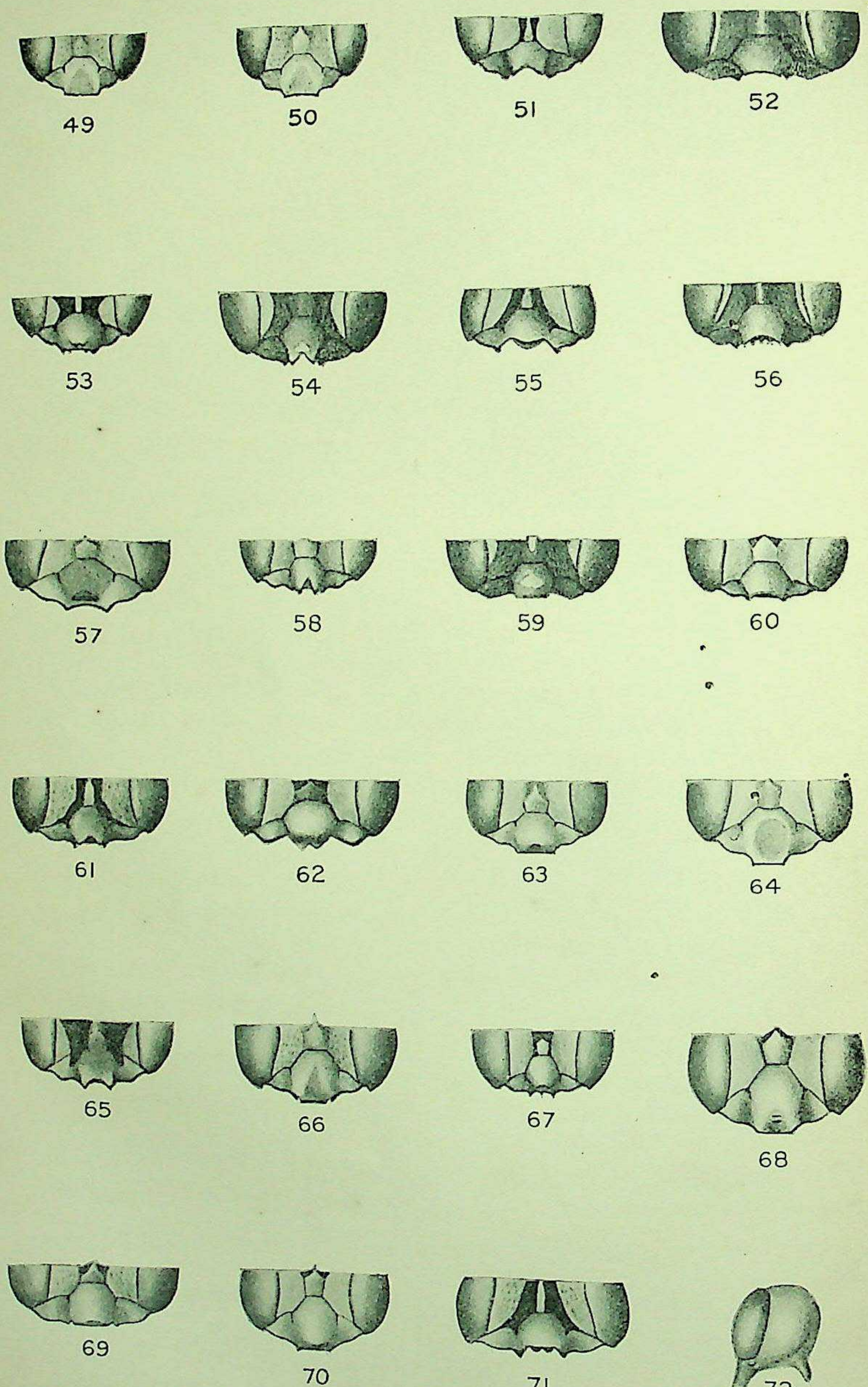
The clypeus resembles that of *C. instabilis* Sm.

Cerceris excavata Cam.

Cerceris excavata Cam. Journ. Straits Asiatic Soc., p. 135, 1902. ♂.

This is the representative of *C. vischnu* Cam. in Borneo.

The male only differs from *vischnu* in having the petiole a little shorter and broader, and in the much less distinctly raised basal area of the second ventral segment. The female has no raised area at the base of the second ventral segment, there is a yellow spot at the base of the second dorsal segment and the wings are strongly shaded with fuscous on the costal margin.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Catherine A. M. Pearce.

INDIAN FOSSORIAL WASPS.

MONOGRAPH OF THE WASPS OF BRITISH INDIA.

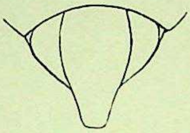
EXPLANATION OF PLATE C.

49.	*Cerceris fortinata*, Cam. ♀.	Front of head.
50.	*Cerceris compta*, Turn. ♀.	,, ,,
51.	*Cerceris instabilis*, Sm. ♀.	,, ,,
52.	*Cerceris elizabethæ*, Bingh. ♀.	,, ,,
53.	*Cerceris mastogaster*, Sm. ♀.	,, ,,
54.	*Cerceris vischnu*, Cam. ♀.	,, ,,
55.	*Cerceris ferox*, Sm. ♀.	,, ,,
56.	*Cerceris violaceipennis*, Cam. ♀.	,, ,,
57.	*Cerceris comberi*, Turn. ♀.	,, ,,
58.	*Cerceris fastidiosa*, Turn. ♀.	,, ,,
59.	*Cerceris melaina*, Turn. ♀.	,, ,,
60.	*Cerceris tristis*, Cam. ♀.	,, ,,
61.	*Cerceris ferocior*, Turn. ♀.	,, ,,
62.	*Cerceris circumcincta*, Turn. ♀.	,, ,,
63.	*Cerceris nursei*, Turn. ♀.	,, ,,
64.	,, ,, ,, ♂.	,, ,,
65.	*Cerceris invita*, Turn. ♀.	,, ,,
66.	*Cerceris novaræ*, Sauss. ♀.	,, ,,
67.	*Cerceris rhyncophora*, Turn. ♀.	,, ,,
68.	*Cerceris hilaris*, Sm. ♂.	,, ,,
69.	*Cerceris baluchistanensis*, Cam. ♀.	,, ,,
70.	*Cerceris boysi*, Turn. ♀.	,, ,,
71.	*Cerceris shelfordi*, Turn. ♀.	,, ,,
72.	*Cerceris inexorabilis*, Turn. ♀.	Side of head.

MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE D.

73.	*Cerceris fortinata*, Cam. ♀.	Pygidial area.
74.	*Cerceris compta*, Turn. ♀.	,, ,,
75.	*Cerceris instabilis*, Sm. ♀.	,, ,,
76.	*Cerceris elizabethæ*, Bingh. ♀.	,, ,,
77.	*Cerceris mastogaster*, Sm. ♀.	,, ,,
78.	*Cerceris vischnu*, Cam. ♀.	,, ,,
79.	*Cerceris ferox*, Sm. ♀.	,, ,,
80.	*Cerceris violaceipennis*, Cam. ♀.	,, ,,
81.	*Cerceris comberi*, Turn. ♀.	,, ,,
82.	*Cerceris fastidiosa*, Turn. ♀.	,, ,,
83.	*Cerceris melaina*, Turn. ♀.	,, ,,
84.	*Cerceris tristis*, Cam ♀.	,, ,,
85.	*Cerceris ferocior*, Turn. ♀.	,, ,,
86.	*Cerceris circumcincta*, Turn. ♀.	,, ,,
87.	*Cerceris nursei*, Turn. ♀.	,, ,,
88.	,, ,, ♂.	,, ,,
89.	*Cerceris invita*, Turn. ♀.	,, ,,
90.	*Cerceris novaræ*, Sauss. ♀.	,, ,,
91.	*Cerceris rhyncophora*, Turn. ♀.	,, ,,
92.	*Cerceris hilaris*, Sm. ♂.	,, ,,
93	*Cerceris baluchistanensis*, Cam. ♀.	,, ,,
94.	*Cerceris boysi*, Turn. ♀.	,, ,,
95.	*Cerceris shelfordi*, Turn. ♀.	,, ,,
96.	*Cerceris mastogaster*, Sm. ♀.	Ventral surface of abdomen.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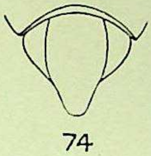
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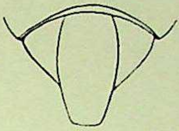
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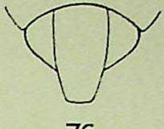
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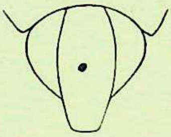
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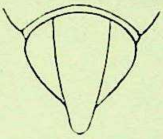
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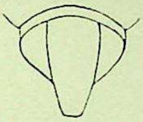
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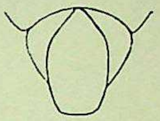
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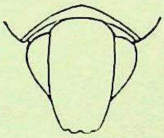
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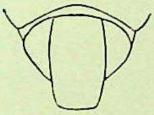
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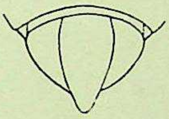
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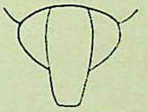
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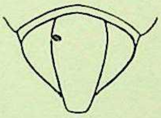
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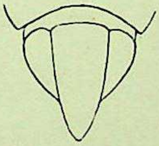
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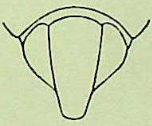
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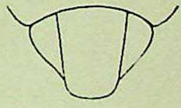
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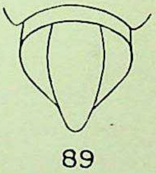
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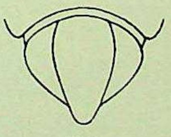
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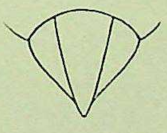
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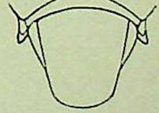
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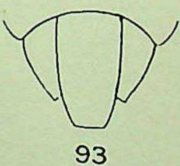
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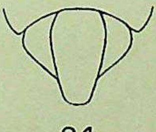
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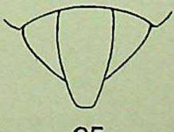
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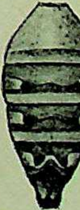
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Catherine A. M. Pearce.

INDIAN FOSSORIAL WASPS.

Cerceris maculata Rad.

Cerceris maculata Rad. Fedtsch: Reise Turkestan, p. 57, Pl. viii, fig. 2, 1877. ♀.

♀. Central lobe of the clypeus more than half as broad again as long, convex, truncate at the apex, with two small spines near the middle of the apical margin. Second joint of the flagellum distinctly longer than the third. Front broad, the eyes diverging slightly towards the clypeus, the cheeks less than half as broad as the eyes. Pronotum very slightly depressed in the middle, rounded at the angles; mesopleuræ without spines. First abdominal segment broadest in the middle, a little broader than long; second ventral segment without a raised area at the base; pygidial area elongate pyriform, very narrowly truncate at the apex. Coarsely punctured; the triangular area at the base of the median segment shining, coarsely longitudinally striated at the base, the median groove transversely striated, the sides very delicately punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Basuft, S. W. Persia (*Escalera*).

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION ... ... No. 2.
LOCALITY ... ... Berars.
DATE ... ... May-June, 1911.
COLLECTED BY ... ... Mr. C. A. Crump.
EARLIER REPORT ... ... No. 1, E. Khandesh,
Vol. XXI, p. 392 (1912).

This collection was made in the northern part of the Berars, commonly known as the Melghat. The country is hilly, and, for the most part, well wooded, the forest being composed of teak mixed with bamboos, and with sundry other trees commonly found associated with it, many of which are evergreen. The subsoil is the Dekhan trap rock, and the crops raised are for the most part those used for local consumption, such as 'nagli' and 'bajri.' The climate too is very much the same as that of the Dekhan. Some of the specimens were taken at Ellichpur and represent the Fauna of the broad valley known as the Payanghat, forming the large bulk of the Berars. Here we find great alluvial black soil plains producing cotton and jowari, whose only tree growth is patches of babhul.

The collection is a small one, comprising 69 specimens belonging to 22 species in 17 genera.

For the most part the species are the same as those contained in the Khandesh collection. Most of those that have been added to the earlier list represent the Fauna of a more jungly country, *e.g.*, the Flying Squirrel, the Wild Dog, the Palm Squirrel, the Barking Deer, and the Four-horned Antelope.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(For synonymy, see Report No. 1.)

♂ 164. Chikalda, Berars.

♀ 187, 192. Sembadoh, Berars.

(*Vide* also Report No. 1.)

These specimens appear quite like those from Khandesh.

Note.—In the notice of *Presbytis entellus* in Report No. 1 by inadvertence the name *leucopus* has been used, it should have been *hypoleucos*.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

1782. *Vespertilio gigantea*, Bruennich. Dyrènes Historie I., p. 45.
1825. *Pteropus medius*, Temminck. Mon. Mamm. I., p. 176.
1870. *Pteropus kelaarti*, Gray. Cat. Monk. &c., p. 104.
1891. *Pteropus medius*, Blanford. Mammalia No. 134.

♂ 197, 199, 202, 208, 211. Pili Sipna Valley, Berars.

Dr. Knud Andersen, who has studied this group, in the preparation of a Catalogue of the Chiroptera, has pointed out to me that the name *giganteus* is nearly 50 years older than *medius*, and must be used for the common Flying-Fox of the plains; he is further of the opinion that the name *leucocephalus*, Hodgs. (with its synonym *assamensis*, McClell.) must be reserved for the Himalayan Flying-Fox. I have therefore omitted them from the synonymy of *giganteus*. The names *giganteus* and *medius* were both based on specimens from Bengal. The Ceylon Flying-Fox apparently differs in no way from that of the peninsula, and *kelaarti* is consequently retained in my synonymy above. Blanford quotes *edwardsi*, Is. Geoffroy, in his synonymy, but the use of this name by Is. Geoffroy was not original, for E. Geoffroy had already given the name, in 1810, to an outwardly somewhat similar, but perfectly distinct, species from Madagascar. The name must be dropped from the synonymy of the Indian Flying-Fox.

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 182. (in al.). ♀ 165 (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 158. Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrelle.

(For synonymy, see Report No. 1.)

♀ 166. (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 168, 169. ♀ 170, 171. Chikalda, Berars.
(*Vide* also Report No. 1.)

MUNGOS MUNGO, Gmel.

The common Indian Mungoose.

(For synonymy, see Report No. 1.)

♂ 156. ♀ 157. Ellichpur, Berars.
(*Vide* also Report No. 1.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

1831. *Canis dukhunensis*, Sykes. P. Z. S., p. 100.
1833. *Canis primævus*, Hodgson. As. Res. XVIII, p. 221.
1863. *Cuon grayiformis*, Hodgson. Catalogue, 2nd Ed., p. 5.
1888. *Cyon dukhunensis*, Blanford. Mammalia No. 70.

♂ 185. Sembadoh, Berars.
♂ 220, 221. Pili Sipna Valley, Berars.

PETAURISTA ORAL, Tick.

The Central Indian Flying Squirrel.

1842. *Pteromys oral*, Tickell. Calc. Journ. N. H. II, p. 401.
1891. *Pteromys oral*, Blanford. Mammalia No. 227 (partim.).

♀ 194. Sembadoh, Berars.
♂ 218; ♀ 223. Pili Sipna Valley, Berars.

I published recently in this Journal (Vol. XX, p. 1012) a paper on the Oriental Flying Squirrels. I there felt obliged to merge the name *oral* in the synonymy of *philippensis*. The present specimens show that it is necessary to revive the former name. The proportions of these specimens are almost exactly those recorded by Tickell in the original description of his Singhboom specimen, and are markedly smaller than that of any other known species south of the Ganges. Otherwise these specimens do not quite agree with the description of *oral*. It seems to me best, however, to list it provisionally as *oral* until we have a topotype with which to compare it.

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

1766. *Sciurus palmarum*, Linnæus. Syst. Nat., p. 86.
1814. *Sciurus penicillatus*, Leach. Zool. Misc. I, p. 6.
1832. *Funambulus indicus*, Lesson. Ill. Zool. pl. xliii.

1891. *Sciurus palmarum*, Blanford. Mammalia No. 253 (partim).

♂ 159, 174. Chikalda, Berars.

♂ 225, ♀ 210, 224. Sipna Valley, Berars.

Here, as in the Surat District, where I originally took *pennanti*, that species occurs with *palmarum*.

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)

♀ 191. Sembadoh, Berars.

♀ 216. Sipna Valley, Berars.

(*Vide* also Report No. 1.)

TATERA INDICA, Hardw.

The Indian Gerbil.

(For synonymy, see Report No. 1.)

♂ 179. Chikalda, Berars.

(*Vide* also Report No. 1.)

VANDELEURIA OLERACEA, Benn.

The Dekhan Tree-Mouse.

1832. *Mus oleraceus*, Bennett. P. Z. S., p. 121.
1859. *Mus badius*, Blyth. J. A. S. B., XXVIII, p. 295.
1867. *Mus nilagiricus*, Jerdon. Mamm. Ind., p. 203.
1891. *Vandeleuria oleracea*, Blanford. Mammalia No. 270.

♂ 163. Chikalda, Berars.

The species was based by Bennett on a specimen collected by Col. Sykes in the Dekhan. The names *dumecola, dumeticola*, and *povensis*, Hodgson, represent the Nepal form (*dumecola* was not *described* and *povensis*, a later name, was probably a young specimen); *Vandeleuria dumeticola* must therefore stand for the northern form (dark but bright tawny) which undoubtedly is distinct from *oleracea*. Of *badius* from Tenasserim and *nilagiricus* of the Nilgiris, no specimens are available for examination, and I therefore leave those names provisionally in the synonymy of *oleracea*.

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)

♂ 176, 178, 184. Chikalda, Berars.

♂ 203, 204, 209. Sipna Valley, Berars.

♂ 230; ♀ 231. Harisel, Berars.

(*Vide* also Report No. 1.)

A very even series, quite like the specimens from Khandesh.

EPIMYS BLANFORDI, Thos.

The white-tailed Rat.

1881. *Mus blanfordi*, Thomas : A. N. N. H. (5) VII, p. 24.
1891. *Mus blanfordi*, Blanford: Mammalia No. 278.

♂ 195; ♀ 189. Sembadoh, Berars.
♂ 217 ; ♀ 198, 212, 213, 227. Sipna Valley, Berars.

The species was based on a somewhat immature ♀, in spirit, from Cuddapah, Madras Presidency. A little later Mr. Thomas received a second spirit specimen, a full grown ♂, also collected by Col. Beddome, and published revised measurements (P. Z. S. 1881, p. 541). Since then our Society has received specimens collected by Mr. Woosnam at Matheran, and Mr. Kinnear at Karwar, and Sai, Kolaba District, and the British Museum has a series collected by Col. Ward at Mandla. C. P. These last appear to be rather larger than any of the rest, otherwise all appear to agree together fairly well.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(For synonymy, see Report No. 1.)

♀ 172, 177, 180. Chikalda, Berars.
♂ 200 215; ♀ 205, 214. Pili Sipna Valley, Berars.

(*Vide* also Report No. 1.)

The British Museum has a spirit specimen collected by Col. Sykes, and two skin specimens collected by the Rev. Mr. Fairbank at Ahmednagar. The present series, though not altogether agreeing with these typical specimens, is so near them that, for the present, at any rate, it must rank as *platythrix*.

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(For synonymy, see Report No. 1.)

♂ 206, 207; ♀ 201. Pili Sipna Valley, Berars.
♂ 228. Kolkaz Sipna Valley, Berars.

(*Vide* also Report No. 1.)

I am not satisfied that these are true *booduga*, but the material of the latter species is so incomplete that I provisionally list them under that name.

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 183. Chikalda, Berars.

(*Vide* also Report No. 1.)

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(For synonymy, see Report No. 1.)

♂ 160, 173; ♀ 167. Chikalda, Berars.

(*Vide* also Report No. 1.)

MUNTIACUS VAGINALIS, Bodd.

The Barking Deer.

1785. *Cervus vaginalis*, Boddaert. Elench. Anim. I., p. 136.
1816. *Cervus subcornutus*, de Blainville. Bull. Soc. Phil., p. 77.
1827. *Cervus aureus*, Hamilton Smith. Griffith's An. Kingd. IV., p. 148
1829. *Cervus ratwa*, Hodgson. As. Res. XVIII., pt. 2, p. 139.
1839. *Cervus melas*, Ogilby. Royle's Bot. Himal., p. LXIII.
1844. *Cervus stylocerus*, Wagner. Schreb: Saüg. Supp. IV., p. 392.
1844. *Cervus albipes*, Wagner, l. c., p. 394.
1872. *Cervulus tamulicus*, Gray. Cat. Rum. Mamm., p. 94.
1891. *Cervulus muntjac*, Blanford. Mammalia No. 362.
1904. *Cervulus grandicornis*, Lyddeker. Field. CIV., p. 780.

♀ 188. Chikalda, Berars.
♀ 193, 196. Sembadoh, Berars.
♂ 222. Pili Sipna Valley, Berars.

Zimmermann's *muntjak* (1780), Blainville's *moschatus* (1816), Gray's *curvostylis* (1872) and Kohlbrugge's *pleiharicus* (1896) were based on Javan, Sumatran, Siamese, and Bornean forms respectively, and must be excluded from the synonymy of the Indian species. The oldest name given to the continental species is *vaginalis*. The names *subcornutus* and *aureus* were based on animals of unknown habitat, but *ratwa*, *melas*, *albipes*, *tamulicus*, and *grandicornis* are names available should any of the forms from the following localities prove to be separable from the Bengal 'Kakar', *viz.*:—Nepal, W. Himalaya, Poona Ghats, Southern India (S. M. Country) and Tenasserim.

TETRACEROS QUADRICORNIS, Blainv.

The four-horned Antelope.

1816. *Antelope* (*Cervicapara*) *quadricornis*, Blainville, Bull. Soc. Phil., p. 78.
1825. *Antelope chickara*, Hardwicke. Trans. L. S. XIV., p. 520.
1839. *Antelope subquadricornutus*, Elliot. Madr. Journ. L. & S. X., p. 225.
1847. *Tetraceros iodes*, Hodgson. Calc. Journ. N. H. VIII., p. 90.
1847. *Tetraceros paccerois*, Hodgson. l. c.
1891. *Tetraceros quadricornis*, Blanford. Mammalia No. 356.

♂ 186. ♀ 190. Sembadoh, Berars.

Collection	... No. 3.
Locality	... Cutch.
Date	... July-August.
Collected by ...	... Mr. C. A. Crump.
Earlier Reports ...	... No. 1, E. Khandesh, Vol. XXI, p. 392 (1912). No. 2, Berars. Vol. XXI, p. 820 (1912).

This Collection was made in the Cutch State, which lies on the Tropic of Cancer, between 68° and 71° East longitude, on the West Coast, from which it is separated by the two Runns (Great and Little). The subsoil of Cutch is composed of stratified rocks of various ages and is covered with recent or subrecent deposits, both wind and water borne, of which the principal are sand and alluvium. Rainfall is very light, intervals of years without rain being known, the fall at Bhuj is said to average about 12 inches. The area collected over is for the most part an alluvial plain, bounded northward and westward by ranges of hills rising in some cases to an altitude of 2,000 feet. Except for some scanty bush growth on these hills, a few large trees in Bhuj and Anjar, and patches of babhul jungle scattered about, for the most part near Tanks (notably an area near the large Tank at Charwa), the whole country is treeless.

In addition to information from the Gazetteer, which I have used in the above description, Mr. Crump furnishes the following detailed descriptions :—

"Bhuj lies in a saucer and its surroundings appear to me to be as varied as can be found in Cutch State. To the W. and N., beyond 10 miles of undulating country, are ranges of mountains. There is an old Fort which harbours many Bats, situated on an isolated hill immediately overlooking the City. Just outside the City walls is a garden, kept up by the State, which is crowded with flourishing trees and shrubs, together with a profusion of flowers."

"Rhoda Motha lies about 10 miles to the North of Bhuj, immediately beyond it limestone and trap hills rise suddenly from a plain of fine sand. Babhul and Pricklypear grow in small patches."

"Nokania, about 3 miles from Rhoda Motha, has very varied surroundings. A large Tank, with a good patch of Babhul and Pricklypear jungle, affords good cover, the rest of the surrounding country is sandy plain, dotted with bushes, and in one direction a wide area of cultivated land."

"Dhonsa is mainly surrounded by cultivation, it has a low range of limestone hills on one side, where some rodents were obtained, but from the rest the results were small."

"Charwa, on the Bhuj side, has rolling hills covered with dense babhul jungle. A fine Tank, 4 or 5 miles round, has been formed by the erection of a bund. Here the trees are larger and the undergrowth thick, affording excellent cover for Leopards (which have been introduced), Pigs, Jackals, etc. Below the Tank is a well stocked garden, and beyond that for some miles jungle growth, confined to a good wide Nullah. The rest of the country is a sandy plain with low rocky hills rising from it. Towards the Bunnee is a large amphitheatre of hills in the midst of which is some good cultivation, surrounded by fair grazing grounds for sheep and cattle. It is here and along the North Coast that Wolves are common."

"Pirwadi is near and very like Dhonsa. The wells have dried up and it is now deserted."

"Anjar is a large town, containing some fine trees. It is surrounded by a flat stretch of cultivated land, which even extended to Kharirobar on the Coast."

"Shikarpur is on the South Coast, eastward from Kharirobar, it is in the midst of cultivation which extends to Markhed and Nanda."

"Poungbe is separated from Nanda by a salt plain, which is covered with water during the monsoon. It is a low plateau with a large central depression, which after the monsoon is covered with long grass giving excellent grazing to cattle, Wild Asses, Pigs and Blackbuck. Apart from grass there is absolutely no cover."

"Padampur has good cultivation around it, and a fairly thick crub jungle on undulating and broken ground. Close by is a group of low hills rising out of fine sand."

"Chitrod is surrounded by an undulating plain, quite bare of trees and mostly under cultivation. On the road to Jhangi the country is still flatter, and almost entirely under cultivation."

C. A. C.

This is a large and most interesting collection. There are 355 specimens divided among 38 species in 28 genera. As was to be expected, from the geographical position of Cutch, the collection is representative of a somewhat different fauna from those of Khandesh and the Berars.

Out of the 38 species 10 are distinctly Northern forms, *viz.*, the two Hedgehogs, the Desert Cat, the Desert Gerbil, the two ashy Spiny Mice, the Northern Field Mouse, the Cutch Rock Rat, the Sind Hare and the Rajputana Porcupine. The Mongoose is a transition form, some of the specimens show distinct signs of the red colouring which characterises *sanguinea*, Blanford, from Sind, while others are quite typical *mungo*. The majority of the species however apparently represent forms equally at home both in the north and the south. Exactly to what extent this is so it remains for further collections to decide.

The majority of these "Southern" forms have already been obtained by the "Mammal Survey" in Khandesh and the Berars, but a few are new to the list, *e.g.*, the bicoloured leaf-nosed Bat and the mouse-tailed Bats, the Caracal, the Civet, the Wolf, the Ratel, and the Pangolin.

Topotypes of the Cutch sheath-tailed Bat have now been obtained; until Mr. Crump collected this Bat at Ajanta, Hyderabad State, it had not I believe been taken since Stoliczka's visit to Cutch about 1870.

Five forms are new to science:—The fine mouse-tailed Bat, whose nearest relative is found in Sumatra, which I have named after Mr. Kinnear, our hardworking Curator. The interesting long-tailed Rat for which I have had to provide a new Genus, as well as a new Species. I have named it *Cremnomys cutchicus*. The Generic name is best translated "Rock Rat" while the Specific name is given in honour of H. H. the Rao of Cutch, to whose good-will we owe this collection and under whose immediate patronage it was made. The two mice, *viz.*, the smaller ashy Spiny

Mouse and the northern Field Mouse, and finally the Rajputana Porcupine.

Mr. Crump has collected and recorded a number of observations in connection with the specimens, from which I have prepared short notes and incorporated them in the report over Mr. Crump's initials.

H. H. the Rao has furnished a list of Cutchee names which have also been recorded.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

(For synonymy, see Report No. 2.)

♂ 349. Charwa, Cutch.

♂ 407, 409 ; ♀ 406, 408. Bhuj, Cutch.

(*Vide* also Report No. 2.)

Vernacular name—WADWAGHAN. (*H. H. the Rao.*)

["Extremely local. There is a colony at Bhuj which roosts in the City, repairing for food to H. H. the Rao's Garden, some even wandering to Charwa, 10 miles away. It is said they are also to be found at Anjar, where there are some large trees."—C. A. C.]

HIPPOSIDEROS FULVUS, Gray.

The bicoloured leaf-nosed Bat.

1838. *Hipposideros fulvus*, Gray. Mag. Zool. Bot. II., p. 492.
1838. *Hipposideros murinus*, Gray. l. c.
1839. *Rhinolophus murinus*, Elliot. Madr. Journ. L. & S. X., p. 99.
1839. *Rhinolophus fulgens*, Elliot. l. c.
1848. *Hipposideros ater*, Templeton. J. A. S. B. XVII., p. 252.
1852. *Hipposideros atratus*, Kelaart. Prod. Faun. Zeyl., p. 16.
1853. *Hipposideros cineraceus*, Blyth. J. A. S. B. XXII., p. 410.
1891. *Hipposiderus bicolor*, Blanford. Mammalia No. 166.

♂ 435, ♀ 421, 439, 446, 447. Bhuj, Cutch.

Temminck's *bicolor* was named from Java, it is a distinct species with smaller ears. I took some specimens near Darjeeling in 1891. The name must be removed from the synonymy of the present bat. Gray named two species, *fulvus* and *murinus*, on specimens sent to him by Elliot, from the Southern Mahratha Country; they were colour phases of one species, a thing not uncommon amongst the *Rhinolophidæ*. A year later Elliot described, presumably the same two forms, under the names *murinus* and *fulgens*. The names *ater*, Templeton, and its modification *atratus*, Kelaart, represent the Ceylon form of the present species and must remain in its synonymy until we have material to show that it is separable. Blyth described *cineraceus* from Pind Dadan Khan in the Punjaub, he states that it is larger than *murinus*, Elliot' but quotes for it a markedly shorter forearm, without topotypes for comparison I must leave the name in the synonymy of *fulvus*

Vernacular name—CHAMDA. (*H.H. the Rao.*)

[“These specimens formed the whole colony of one cave. They hung from the roof by their hind legs and did not cling or crawl on the wall.”—C.A.C.]

SCOTOPHILUS KUHLI, Leach.

The common yellow Bat.

(For synonymy, see Report No. 1.)

♀ 309, 312, 327 (in al.)....Bhuj, Cutch.

(*Vide* also Report No. 1.)

These specimens are undoubtedly *kuhli* though a trifle smaller and somewhat differently coloured from those received from Khandesh.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS CEYLONICUS, Kel.

Kelaarts Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 452. Bhuj, Cutch.

♀ 383 (in al.) Charwa, Cutch.

(*Vide* also Report No. 1.)

It is a pity only one specimen was obtained; had there been a series I should have had no hesitation in separating this as a distinct local race, so different is this one from more southern specimens.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Bat.

(For synonymy, see Report No. 1.)

♂ 316 (in al.) 530 (imm.), 561 (imm.), ♀ 320, 329, 343 (in al.) 555. Bhuj, Cutch.

(*Vide* also Report Nos. 1 and 2.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 300 (in al.), 425 (in al.), 454 (albine), 466, 467, 468, 469, 470, 471, 526, 527, 535, 545, 558, 559, 569, 570, 571, 572, 575, 576, 577, 578, 580, 581, 582, 583, 584, 585, 586, 589, 591, 592, 594, 595, 596.

♀ 422, 423, 424, 426 (in al.), 428, 429, 430, 431 (in al.), 432, 433, 440, 472, 473, 560, 573, 574, 587, 590, 593, Bhuj. Cutch.

(*Vide* also Reports Nos. 1 and 2.)

This is a very even series and differs somewhat in colour from the Khandesh specimens, which latter quite resemble some specimens, in the National Collection, from Bombay. (Kennery Caves.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

["These were taken from a small Tomb. They cling to the wall and crawl about with great ease, their flight is rapid."—C. A. C.]

TAPHOZOUS KACHHENSIS, Dobs.

The Cutch sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 541, 546, 551 ; ♀ 532, 533, 534, 540, 547, 548, 549, 550, 552, 553 (in al.), 554 (in al.), 588. Bhuj, Cutch.

(*Vide* also Report No. 1.)

These specimens are topotypes of Dobson's *kachhensis*, they do not appear to differ in any way from those obtained at Ajanta.

["These bats were found in a tomb, both sexes together, no other species with them ; all were full grown but some were undoubtedly of this season. They cling rather than hang and can crawl backwards up a wall with fair speed, using thumbs as well as feet. They are very noisy, especially in the evening just before emerging into the open."

"I several times observed this species searching round bushes for food, it hovers over the bush and actually settles for a fraction of a second, while picking an insect from among the foliage, immediately afterwards, as it flies over-head a distinct clicking sound can be heard as if a beetle or some other hard substance were being chewed."—C. A. C.]

RHINOPOMA HARDWICKII, Gray.

The lesser Indian mouse-tailed Bat.

1831. *Rhinopoma hardwickii*, Gray. Zool. Misc., p. 37.
1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223 (*partim*).

♂ 323, 525, 564 ; ♀ 455, 456, 465, 528, 529, 557.

RHINOPOMA KINNEARI, Wrought.

The greater Indian mouse-tailed Bat.

1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223. (*partim.*)
1912. *Rhinopoma kinneari*, Wroughton. Journ. B.N.H.S., Vol. XXI p. 767.

♂ 457, 458, 459, 460 (in al.), 463 (in al.), 464 (in al.), 475 (in al.), 476 (in al.), 478, 479, 579. Bhuj, Cutch.

["These long-tailed bats are common near Bhuj, they are high but not rapid fliers."—C. A. C.]

NYCTINOMUS TRAGATUS, Dobs.

Dobson's wrinkled-lipped Bat.

1874. *Nyctinomus tragatus*, Dobson. J. A. S. B. XLIII., 2., p. 143.

1891. *Nyctinomus tragatus*, Blanford. Mammalia No. 224.

♂ 536, 538; ♀ 453, 537, 539, 542, 543, 544. Bhuj, Cutch.

The type, a spirit specimen in the Indian Museum, is said to have been taken at Calcutta. The National Collection has only 3 specimens, from known localities so far apart as the Punjaub and the Malabar Coast.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

["These bats were found singly, or two or three together, in cracks in walls or in narrow spaces, formed by slabs of stone leaning against walls. They do not hang suspended from a roof but cling, in inverted position often quite wedged in the crevice; they make a low clicking noise when disturbed and have a quick flight."—C. A. C.]

ERINACEUS COLLARIS, Gray and Hardw.

Hardwicke's Hedgehog.

1830. *Erinaceus collaris*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 8.

1832. *Erinaceus spatangus*, Bennett. P. Z. S., p. 123.

1832. *Erinaceus grayi*, Bennett. P., Z. S., p. 124.

1839. *Erinaceus indicus*, Royle. Ill. Ind. Zool. (*nomen nudum*).

1888. *Erinaceus collaris*, Blanford. Mammalia No. 104.

♂ 240, 303, 305, 306, 346, 484; ♀ 304, 345, 347, 483, 486, 487, 565. Bhuj, Cutch.

♂ 266. Nokania, Cutch.

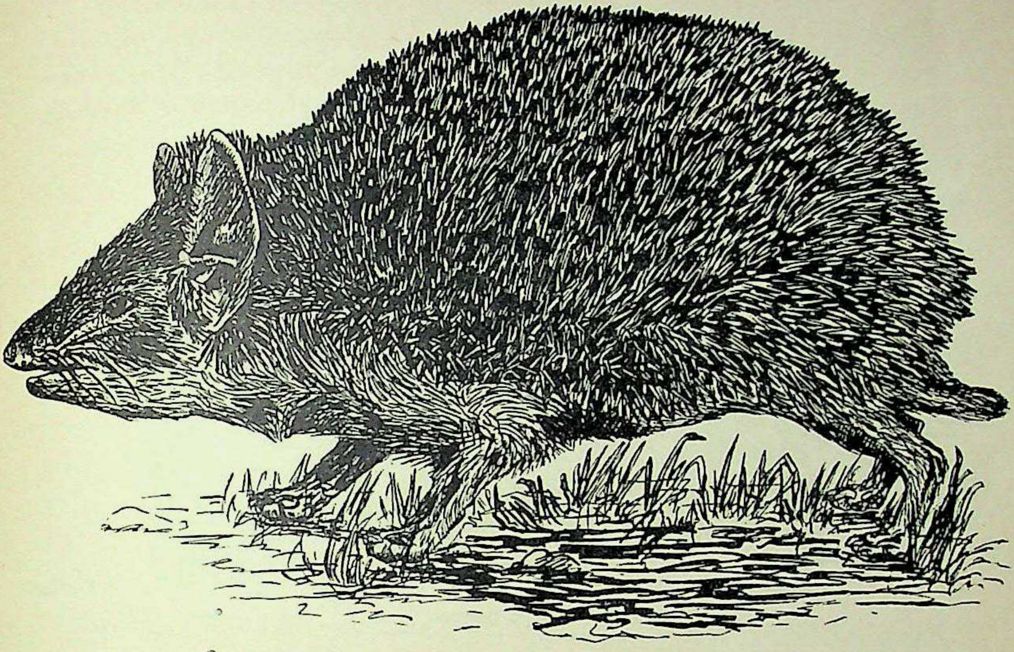
I dealt recently with the synonymy of this species, in this Journal (Vol. XX., p. 80), and there is nothing more to be done until a series of topotypes from the Doab is available for comparison.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)

["Hedgehogs seem to be very local in their distribution. They are quite common near Bhuj, rarer in the north of the State, less so in the east, and very common again in the extreme east. The Hedgehog is entirely nocturnal. It hunts singly, keeping up a steady trot in its search for food and no doubt covering a considerable distance during a night.

When handled, they sometimes inflate and deflate themselves, making a noise like the rush of air from a pair of bellows. When face downwards and not tightly curled up they can jerk up the back: this method of defence is practised most frequently by the young. Some Hedgehogs I had in captivity fought occasionally, attacking each other's faces, and making a noise like angry kittens; two large males on one occasion fought until one was severely bitten under the ear and killed.

The local tradition says that the Jackal feeds on the Hedgehog; he turns the rolled up Hedgehog on his back and drops urine on him to make him open out. The Hedgehog is incapable of jumping even the shortest distance either up or down."—C. A. C.]



Hardwicke's Hedgehog, Erinaceus collaris. ½ *nat. size.*

ERINACEUS MICROPUS, Blyth.

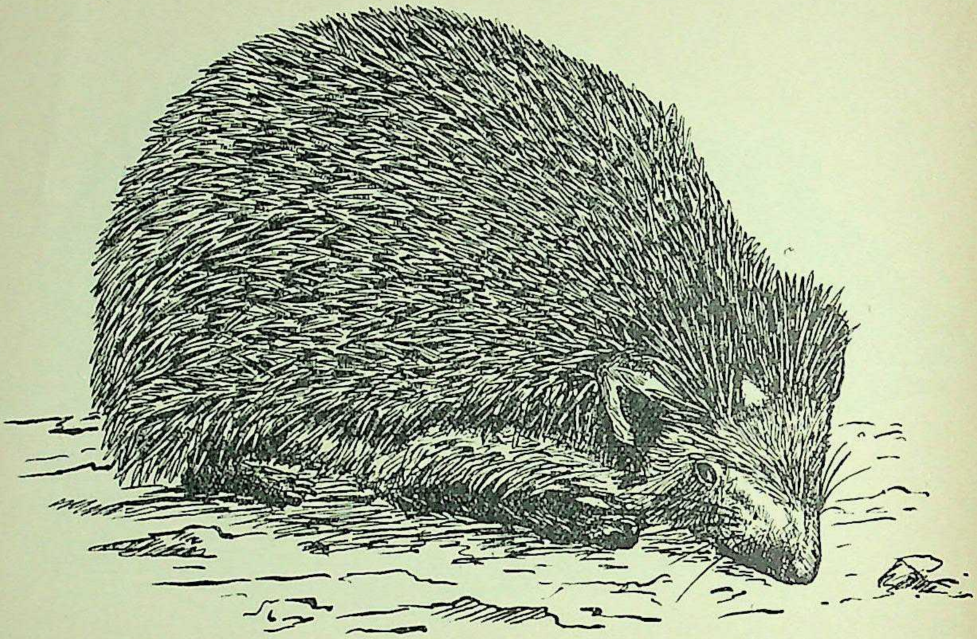
The Northern pale Hedgehog.

1846. *Erinaceus micropus*, Blyth. J. A. S. B. XV, p. 170.
1872. *Erinaceus pictus*, Stoliczka. J. A. S. B. XLI (2), p. 223.
1888. *Erinaceus pictus*, Blanford. Mammalia No. 107.
1910. *Erinaceus micropus*, Wroughton. Journ. B.N.H.S., Vol. XX, p. 80.

♀ 285. Nokania, Cutch.
♂ 299. ♀ 298. Dhonsa, Cutch.
♂ 302. 344, 348, 481, 482, 567; ♀ 300, 301, 480, 566, 588. Bhuj, Cutch.
♂ 500. Makhal, Cutch.
♂ 502. Nanda, Cutch.

As I recently pointed out in a paper (l. c.) in this Journal, the name *micropus*, used for the southern Hedgehog, by Blanford, was based by Blyth on a specimen from Bhawalpur, and applied to the present species; the name *pictus*, given by Stoliczka to the Cutch species being sunk as a synonym, that form not being separable from the Bhawalpur Hedgehog.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)



The Northern pale Hedgehog, Erinaceus micropus. ½ nat. size.

The above drawing of the Northern pale Hedgehog is hardly light enough in comparison with that of Hardwicke's Hedgehog on the preceding page.

These two hedgehogs can readily be distinguished by the difference in colour, Hardwicke's being dark and the Northern pale, as its name implies, light. Besides colour the two species are at once separated by the absence in Hardwicke's of a naked furrow in the middle of the head, which, as can be seen in the drawing, is very distinct in the Northern pale Hedgehog.

PACHYURA, sp.

Shrews.

♂ 331. 404, 413, 414, 415 ; ♀ 332, 405, 444. Bhuj, Cutch.
♂ 477. Bhuj, Cutch.
♀ 284. Nokania, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—ANDHI-CHHUNCHH. (*H. H. the Rao.*)

["Musk shrews are fairly common. Two kept in captivity showed great dexterity in catching flies on the wing, raising themselves on their hind legs, and with quick movements of the head, snapping at the flies."—C. A. C.]

Felis affinis, Gray and Hardw.

The Jungle Cat.

(For synonymy, see Report No. I.)

♂ 264. ♀ 264. Nokania, Cutch.
♀ 326. Bhuj, Cutch.
♂ 365. 376, 387; ♀ 367. Charwa, Cutch.
♀ 523. Chitrod, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—Jhang-meno. (*H. H. the Rao.*)

["Common wherever there is sufficient cover. It is chiefly nocturnal."—C. A. C.]

Felis ornata, Gray and Hardw.

The Indian Desert Cat.

1832. *Felis ornata*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 2.
1837. *Felis servalina*, Jardine. Nat. Libr., II, p. 232.

♂ 241. Bhuj, Cutch.

Vernacular name—Jhang-meno. (*H. H. the Rao.*)

["One specimen only was obtained, shot over the carcase of a fresh killed sheep. I believe it to be commoner than is supposed, judging from the number of cat-tracks found in quite open ground round burrows of the Gerbil, where *affinis* is unlikely to have gone."—C. A. C.]

Felis caracal, Guld.

The Caracal.

1776. *Felis caracal*, Guldenstadt. Nov. Com. Pet. XX, p. 500.
1888. *Felis caracal*, Blanford. Mammalia No. 42.

♂ 289. Dhonsa, Cutch.
♀ 403. Bhuj, Cutch.

Vernacular name—Hayanaṫro. (*H. H. the Rao.*)

["Reported to be fairly common in the N. and N. W. Hills."—C. A. C.]

Viverricula malaccensis, Gmel.

The small Indian Civet.

1788. *Viverra malaccensis*, Gmelin. Syst. Nat. I, p. 92.
1817. *Viverra indica*, Geoffroy. Desm. Nouv. Dict. VII, p. 170.
1832. *Viverra bengalensis*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 4.
1832. *Viverra pallida*, Gray. P. Z. S., p. 63.
1888. *Viverricula malaccensis*, Blanford. Mammalia No. 48.

♂ 297. Dhonsa, Cutch.
♀ 485. Bhuj, Cutch.

Horsfield's name *rasse* must be left out of the synonymy of this species, it belongs to the Javan species which is distinct.

These specimens might have been expected to fall into the sub-species *deserti*, Bonhote, from Rajputana, but neither in colouration nor skull characters do they resemble Bonhote's type. One of the specimens is an extraordinarily aged individual, the molars being worn entirely away, their roots only showing beyond the jaw.

Vernacular name—JABADIO. (*H. H. the Rao.*)

"This Civet is nocturnal and very shy."—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(For synonymy see Report No. 1.)

♂ 252, 339. Bhuj, Cutch.
♂ 253, 270, 277 ; ♀ 267, 269. Nokania, Cutch.
♂ 293. Dhonsa, Cutch.
♂ 373 ; ♀ 354, 355, 392. Charwa, Cutch.
♀ 400. Perwadi, Cutch.

(*Vide* also Reports Nos. 1 & 2.)

Vernacular name—NORIYO. (*H. H. the Rao.*)

["The Mongoose is very common in Cutch, particularly in the north, rarer towards the east coast. It lives under rocks and in holes, apparently dug by itself, it is diurnal, very bold, though wary, and excessively inquisitive ; it rarely goes any distance from cover. It climbs well. When trapped it screams loudly, but normally anger is shown by arching the back and a growl like a cat."

"I was told by an eye witness that a mongoose attacked a snake which was coiled round a branch near the ground, the snake kept the mongoose off for some time, until the latter retired out of sight. The snake then descended to the ground and the mongoose, with a lightning-like rush from a neighbouring bush seized it by the head."—C. A. C.]

H. H. the Rao in a note to Mr. Crump expresses the opinion—

(1) that the mongoose we get here has "a white tip to its tail, and is not the same as the one commonly met with elsewhere in India which has a distinct black tip to its tail." I think H. H. must have been thinking of *Mungos smithi*, a quite distinct and somewhat larger animal, which is the only mongoose in India with a distinct black tip to its tail. The present specimens seem to average a shade smaller than those from Khandesh and Berar, and have a very slightly more reddish colouration in the bars across the tail than is found in the latter.

2) "The Cutch mongoose is probably the same one as in Sindh." The North Sind mongoose (i. e., *ferrugineus*, Blanford) is strikingly different in its general bright rufous colouration and red tail-tip.

Some Rajputana specimens in the National Collection seem to be intermediate between *ferrugineus* and true *mungo* as represented by the present series and the specimens from Khandesh and the Berars.

HYÆNA HYÆNA, L.

The striped Hyæna.

(For synonymy, see Report No. 1.)

♂ 259, 282. Nokania, Cutch.
♂ 330 ; ♀ 328. Bhuj, Cutch.

(*Vide* also Report No. 1.)

CANIS PALLIPES, Sykes.

The Indian Wolf.

1831. *Canis pallipes*, Sykes. P. Z. S., p. 101.
1888. *Canis pallipes*, Blanford. Mammalia No. 68.

♂ 390 ; ♀ 391. Charwa, Cutch.

Vernacular name—BHAGAD. (*H. H. the Rao.*)

["The Wolf is common along the North Coast of Cutch especially so in the Bunnee, where he preys on the sheep sent there to graze. I saw a pack of seven at Rhoda Motha, and another of eight near Charwa from which the two specimens were obtained. In the north of the State many sheep are killed by wolves. In the Bunnee, Wolves are said to attack Shepherds occasionally but are easily driven off with sticks. So far as I could learn, Wolves are very rare in the South of Cutch and are unknown in the East."—C. A. C.]

CANIS INDICUS, Hodgs.

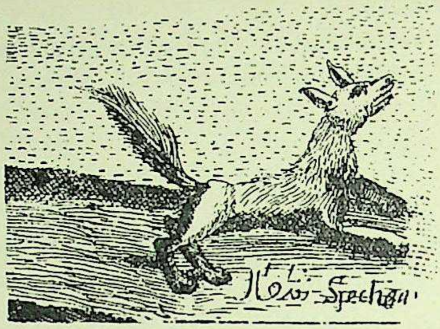
The common Indian Jackal.

1833. *Canis aureus indicus*, Hodgson. As. Res. XVIII, p. 237.
1888. *Canis aureus*, Blanford. Mammalia No. 69.

♀ 245, 248. Rhoda Motha, Cutch.
♀ 278, 286. Nokania, Cutch.
♂ 314. Bhuj, Cutch.
♂ 375 ; ♀ 386. Charwa, Cutch.
♀ 503. Nanda, Cutch.

(*Vide* also Report No. 1.)

Linnæus in describing *aureus* writes "nitide flavus . . . . Descriptio vera animalis etiamnum defecit." He had never seen the animal either dead or alive, but based his recognition of it on an account by Kæmpfer of an animal seen by him in the Province of Lar, on the Persian Gulf. While giving a long account of its habits, &c., Kæmpfer gave no detailed description of the animal itself, he furnished however a figure of which I give an exact reproduction here.



Kæmpfer's figure of the Persian Gulf Jackal (1712) on which Linnæus based his *Canis aureus* (1756).

After trying for several years, our Society has at last succeeded in obtaining two specimens from Bunder Abbas, which it has presented to the National Collection, and which may, I think, be confidently accepted as topotypes.

Basing on these it appears that the true *aureus* of S. Persia differs considerably from the Indian Jackal. The bases of the hairs, in the former are white, while in the latter, they are yellow or some shade of brown. The face and ears (externally) of all Indian Jackals which I have seen are bright tawny, while in the Persian Gulf *aureus* the face is grizzled buff and black and the ears are pinkish-buff.

In their skulls the two forms differ but little. In the Indian form, however, the teeth between the carnassial and the canine (upper) have spaces between them, while in true *aureus* they touch one another and even to a slight extent overlap. The result of this in the living animal must be that the Indian Jackal has a longer muzzle, which is just what would have been expected by anyone familiar with dog-breeding in India.

I give here for easy reference a comparative table of some skull measurements :—

——	*aureus*, Persian Gulf.	*indicus*, Nepal.	*indicus*, Khandesh.	*indicus*, Cutch.
Condylo-basal length ..	145	148	154	149
Basilar length	133	140	142	138
Greatest breadth	81	88	85	83
Nasals length	49	54	52	55
Palatilar length	70	74	75	72
M^2 to front of canine ..	62	66	69	66

I propose to drop the name *aureus* altogether for the Indian Jackal and to adopt provisionally Hodgson's name *indicus*. I advisedly use the word provisionally, for until much more material is available we are not in a position to assume that the Jackal remains absolutely unchanged throughout all India, indeed so far as I am now able to judge such is not the case.

Vernacular name—SIYAD. (*H. H. the Rao.*)

[" Jackals are extremely common all over Cutch. They are very susceptible to rabies".—C. A. C.]

VULPES BENGALENSIS, Shaw.

The common Indian Fox.

(For synonymy, see Report No. 1.)

♂ 239 ; ♀ 238. Bhuj, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—LONKDO (*H. H. the Rao.*)

VULPES LEUCOPUS, Blyth.

The Indian desert Fox.

1854. *Vulpes leucopus*, Blyth. J. A. S. B., XXIII, p. 729.

♀ 268. Nokania, Cutch.

My identification of this specimen is not satisfactory, but, without more material, I have no option but to label it *V. leucopus*. I cannot agree with Blanford that *griffithi* and *pusilla* are identical with *leucopus*. If the latter name ultimately proves to be synonymous with *leucopus*, it will take its place as the name of the species, with *leucopus* as a synonym, for *pusilla* is the older.

Vernacular name—LONKDO. (*H. H. the Rao.*)

MELLIVORA INDICA, Kerr.

The Indian Ratel.

1792. *Ursus indicus*, Kerr. Anim. Kingd., p. 188.
1834. *Ursitaxus inauritus*, Hodgson. As. Res. XIX, p. 61
1888. *Mellivora indica*, Blanford. Mammalia No. 89.

♂ 287. Dhonsa, Cutch.
♂ 333. Bhuj, Cutch.

Vernacular name—GHURNAR. (*H. H. the Rao.*)

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)

♂ 262, 263 ; ♀ 258. Nokania, Cutch.
♂ 340, 341 ; ♀ 313, 402. Bhuj, Cutch.
♀ 362. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

Vernacular name—KHILODI. (*H. H. the Rao.*)

["Plentiful in Bhuj and Charwa, not very common in other parts, rare in the East."—C. A. C.]

MERIONES HURRIANÆ, Jerd.

The Indian desert Gerbil.

1867. *Gerbillus hurrianæ*, Jerdon. Mamm. Ind., p. 186.
1891. *Gerbillus hurrianæ*, Blanford. Mammalia No. 265.

♂ 243 ; ♀ 247, 254, 255. Rhoda Motha, Cutch.
♂ 265, 275. Nokonia, Cutch.
♂ 310, 318, 319 ; ♀ 308, 531, 556. Bhuj, Cutch.
♂ 353. Charwa, Cutch.
♀ 398. Pirwadi, Cutch.
♂ 520, 521 ; ♀ 519, 522. Chitrod, Cutch.

The names *indicus* and *erythrourus*, quoted by Blanford in the synonymy of this species, represent distinct species so that I have omitted them entirely. The present series seems to be quite typical.

Vernacular name—KHETRAU-UNDAR. (*H. H. the Rao.*)

[" The common Gerbil of Cutch, found wherever the soil is light or sandy ; it is by no means entirely nocturnal, individuals may be seen burrowing or feeding at any time of the day, but especially in the morning. It often sits upright with the forefeet suspended but, with an upward jerk of its tail, it plunges into its burrow at the least alarm. It can move about fairly rapidly ; usually keeping the body close to the ground, it moves by a series of little leaps if seriously alarmed or pursued. It seems to trust a good deal to its close coloured resemblance to its surroundings to escape detection, and, when feeding, may be approached near enough to bring its slightest movements under observation. When feeding it sits upright and conveys, with great rapidity, pieces of grass to its incessantly working jaws.

My attempts to photograph it however were not a success.

Its burrows are in groups of 2 or 3 or more together, each burrow has several entrances, all leading to a central chamber, in which, after the rains, considerable stores of seeds are probably stored. A pair of adults inhabit each burrow and appear to resent the intrusion of strangers."—C. A. C.]

MILLARDIA MELTADA, Gray.

The soft-furred Field-Rat.

(For synonymy, see Report No. 1

♂ 242. Rhoda Notha, Cutch.
♀ 271, 272. Nokania, Cutch.

(*Vide* also Report No. 1.)

CREMNOMYS CUTCHICUS, Wrought.

The Cutch Rock-Rat.

1912. *Cremnomys cutchicus*, Wroughton. Journ. B. N. H. S., Vol. XXI, p. 341.

♂ 249; ♀ 246, 250. Rhoda Motha, Cutch.

♂ 256, 274; ♀ 273. Nokania, Cutch.

♂ 288, 290, 291, 295; ♀ 292. Dhonsa, Cutch.

♂ 350, 356, 358, 359, 360, 369, 371, 372; ♀ 357, 378, 388. Charwa, Cutch.

♂ 394, 395; ♀ 396, 397, 399. Pirwadi, Cutch.

♂ 510; ♀ 509, 511, 512, 516, 517. Padampur, Cutch.

["These long-tailed Mice are found wherever there are rocky hills, particularly among limestone. They are nocturnal, and feed on grass, seeds, and the leaves of a small bush, and live under and among the rocks: they seem to be gregarious from the fact that in places large collections of droppings may be found in hollows under rocks."—C. A. C.]

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)

♂ 324, 325, 336, 416, 436, 438, 451; ♀ 311, 322, 334, 335, 337, 410, 411, 416, 417, 419, 439, 445, 474. Bhuj, Cutch.

♂ 504; ♀ 505. Adesar, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

There appears to be no noticeable variation in the specimens so far received.

Vernacular name—GAMTI-UNDAR. (*H. H. the Rao.*)

["Rats are very common everywhere, they keep to huts and houses and are protected and fed by the Banyas."—C. A. C.]

MUS MUSCULUS, L.

The common House-Mouse.

♂ 437 (imm); ♀ 420. Bhuj, Cutch.

(*Vide* also Report No. 1.)

I must, much against the grain, still use this name though the present specimens bear little or no resemblance to true *musculus*. The names *dubius*, *homourus*, and *urbanus* of Hodgson appear to all represent a species not unlike these specimens but with such poor material it is impossible to differentiate. Good series of house mice from all over India are a great desideratum.

Vernacular name—UNDEDI. (*H. H. the Rao.*)

["House mice are not common in Cutch, but few were taken in Bhuj. They were reported from the North but not known in the East of the State."—C. A. C.]

Leggada sadhu, Wrought.

The ashy Spiny Mouse.

1911. *Leggada platythrix sadhu,* Wroughton. Journ. B. N. H. S., Vol. XX. p. 1001.,

♂ 251. Rhoda Motha, Cutch.

♂ 294; ♀ 296. Dhensa, Cutch.

♂ $351\frac{3}{4}$, 379, 381, 384, 389; ♀ 352, 380. Charwa, Cutch.

♂ 508, 518. Padampur, Cutch.

This fine series shows that *sadhu* can no longer be classed as a sub-species of *platythrix.* It represents indeed a separate group characterised by the partial closing in of the mesopterygoid fossa behind the posterior nares and a mammary formula of 4-2-12.

[" These spiny mice were found usually on dark, soft soil, among Babhul jungle and beneath fallen trees but always on hill sides. They are usually most plentiful near water."—C. A. C.]

Leggada cinderella, Wrought.

The smaller ashy Spiny Mouse.

1912. *Leggada cinderella,* Wroughton. B. N. H. S. Vol. XXI, p. 770.

♂ 257, 280; ♂ 281. Rhoda Motha, Cutch.

♂ 307, 321, 482. Bhuj, Cutch.

♂ 377; ♂ 385. Charwa, Cutch.

♂ 507. Padampur, Cutch.

The type specimen of this species is an old female, of which the measurement of the head and body is recorded as 85 mm., other fully grown specimens measure 83, 84, etc. Among the specimens of *L. sadhu* collected by Mr. Crump, this measurement is recorded as 104 mm., in one, while scarcely any, and those immature, are under 88 mm.

Leggada dunni, Wrought.

The Northern Field-Mouse.

1891. *Mus booduga,* Blanford. Mammalia No. 287. (*partim*).

1912. *Leggada dunni,* Wroughton. Journ. B. N. H. S. *supra.* p. 339.

♂ 279. Nokania, Cutch.

A series collected by Major Dunn, R.A.M.C., has been waiting some time for separation from *booduga.* I have now described it earlier in the last number (No. 2, Vol. XXI) of the Journal. The present specimen belongs to the species. It has the under parts pure white as in some of the Ambala specimens.

Golunda ellioti, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 366, 382. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

LEPUS DAYANUS, Blanf.

The Sind Hare.

1874. *Lepus dayanus*, Blanford. P. Z. S., p. 663.
1884. *Lepus joongshaiensis*, Murray. Vert. Zool. Sind., p. 51.

♂ 401 ; ♀ 236, 237, 317. Bhuj. Cutch.
♂ 283. Nokania, Cutch.
♂ 342. Bhuj, Cutch.
♀ 361, 363, 364. Charwa, Cutch.
♂ 493; ♀ 488, 494. Anjar, Cutch.
♂ 498, 499. Makhal, Cutch.
♀ 513, 514. Padampur, Cutch.

Vernacular name—SAO. (*H. H. the Rao.*)

["Hares are very common throughout Cutch. They breed in June and July and again in September and October, having 1 or 2 young at a birth. The Shikaris assert that there are two species in Cutch, a larger and a smaller."—C. A. C.]

HYSTRIX CUNEICEPS, Wrought.

The Rajputana Porcupine.

1892. *Hystrix leucura*, Blanford. Mammalia. No. 315.
1912. *Hystrix leucura cuneiceps*, Wroughton. Journ. B. N. S., Vol. XXI. p. 771.

♀. 244. Rhoda Motha, Cutch.
♂. 261. Nokania, Cutch.

This form which I have described on an earlier page of this Journal is easily recognisable by its smaller size and its rusty colouration compared with the black of true *leucura* and by its wedge-shaped skull.

Vernacular name—SED. (*H. H. the Rao.*)

["In Cutch, porcupines seem to favour the shelter of rocks rather than making their own burrows. They are not known further East than Chitrod, are said to be rare to the S. E. of Bhuj, and comparatively common along the north coast, and the same round Charwa and to the West."—C. A. C.]

GAZELLA BENNETTI, Sykes.

The Indian Gazelle.

(For synonymy, see Report No. 1.)

♂ 489, 490, 491, 496, 497 ; ♀ 492, 495. Anjar, Cutch.
♀ 524. Chitrod, Cutch.

(*Vide* also Report No. 1.)

Vernacular names—CHINKARO, RATADIO, KAR-PUCHO. (*H. H. the Rao.*)

MANIS CRASSICAUDATA, G. St. Hil.

The Indian Pangolin.

1803. *Manis crassicaudata*, G. St. Hilaire. Cat. Mamm., p. 213.
1834. *Manis indicus*, Lesson. Suite. Mamm., IV., p. 520.
1842. *Manis (Phatagis) laticauda*, Sundevall. Vet. Ak. Handl., p. 258.
1872. *Pholidotus bengalensis*, Fitzinger. S. B. Ak. Wien., p. 64.

♂ 315. Bhuj, Cutch.

The name *pentadactyla* which was based on an animal from Formosa must be reserved for the Chinese Pangolin, as must *brachyura* for the same reason.

Vernacular name—CHHALO. (*H. H. the Rao.*)

COLLECTION ...	No. 4.
LOCALITY ...	Nimar.
DATE	November-December.
COLLECTED BY ...	Mr. C. A. Crump.
EARLIER REPORTS ...	No. 1, E. Khandesh, Vol. XXI, p. 392. No. 2, Berars, Vol. XXI, p. 820. No. 3, Cutch, Vol. XXI, p. 826.

Nimar, the district in which the present collection was made, is on the Satpura Plateau, about 21°-30′ N. Latitude, and 76°-20′ E. Longitude. The soil is the Dekhan trap. The country is much broken up into ranges of low hills. These are covered with the usual Satpura tree growth of *Boswellia* and *Hardwickia*, the intervening cultivation being mostly of Jawari. The annual rainfall is about 32 inches. The climate and topography of this district are sufficiently like those of E. Khandesh and the Berars to render it probable that it would carry much the same Fauna, and though a few species were obtained here for the first time, they were such as might, equally well, have been taken in either or both of the other localities.

The collection includes 170 specimens belonging to 27 species, in 22 genera; of these 4 are new to the list of species obtained by Mr. Crump so far, and one is new to science. Amongst the more interesting things are the two small shrews and the new mouse.

The former I have allotted to two species with considerable doubt. The *Pachyura* group of shrews, with 18 upper teeth, are found all over the plains of India and are represented by one species in

Europe, *Pachyura etrusca*, found on the Mediterranean littoral, and in Africa by *P. madagascariensis* from Madagascar, *P. leucura* from Zanzibar, and *P. gracilis* from South Africa. Curiously all these four species are pigmies, and closely related to the animal which I have here called *P. perrotteti*. I have heard it stated that the African species are constantly found in white ants' nests. I have a list of no less than 55 names already given to the representatives of the *Pachyura* group in India and until a very much larger and more representative collection of specimens is available for study, but little can be done to sort out this tangle of names.

The new mouse is most interesting. I have given a description of it on an earlier page. In its coat and some characters of the skull it closely resembles *Leggada platythrix*, its size however and dentition show it to be a true *Mus*. Unfortunately Mr. Crump only obtained one male specimen, a female specimen, showing the mammary formula, is a great desideratum ; it will be most interesting to discover whether in this character this animal is allied to *L. platythrix* with its 12 mammæ, or to *Mus* with only 10.

Mr. Crump seems to have had very great difficulty in trapping the smaller Rodents. He suggests that the harvest season, and the consequent abundance of food in the fields, may have been the reason. Mr. Crump also writes—" I have before observed that the Jungle Cat is by no means exclusively nocturnal, but in other places I have not seen them hunting regularly in broad daylight ; and I suggest that this change of tactics on the part of these cats at Hewra is because they feed principally on birds, owing to the scarcity of rats and mice."

Mr. Crump has recorded a number of local vernacular names, but as they are, with one exception, the same as those recorded by Blanford I have not entered them. The name " Bija " given for the lesser Civet must, I think, be a mistake, for it is one very generally used for the Indian Ratel.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(Synonymy in No. 1.)

664. Hewra, Nimar.

(*See* also Reports 1 and 2.)

["These Langurs, from the top of a very lofty tree can reach the ground in about four leaps or rather drops; these drops are made in quick succession, in an upright position, not, as a rule, on to heavy boughs but among the foliage. When alarmed and running through long grass they get along in great bounds, and while running, frequently raise themselves to their full height to look round. I saw young of all ages in one party—an old female was playing with her young one which she grasped by both hands, threw it in the air, and caught it again by the hands as it reached the ground.

"A dead monkey is one of the finest baits for Hyænas, Jackals and Cats."—C. A. C.]

PTEROPUS GIGANTEUS, Brunn.

The common Flying-Fox.

(Synonymy in No. 2.)

♂ 602. ♀ 603 .. .. Asirgarh, Nimar.
♂ 700. ♀ 697, 701 .. Siwal, Nimar.

(*See* Reports Nos. 2 and 3.)

CYNOPTERUS SPHINX, Vahl.

The short-nosed Fruit Bat.

1797. *Vespertilio sphinx*, Vahl. Skr. Nat. Selsk. IV., p. 123.
1797. *Vespertilio fibulatus*, Vahl. l. c., p. 124.
1803. *Pteropus pusillus*, E. Geoffroy. Cat. Mamm., p. 49.
1810. *Pteropus marginatus*, E. Geoffroy. Ann. Mus. XV., p. 97.
1870. *Cynopterus marginatus, ellioti*, Gray. Cat. Monk., &c., p. 122.
1891. *Cynopterus marginatus*, Blanford. Mammalia, No 138.

♀ 702 .. .. Mandva, Nimar.

Dr. K. Andersen has kindly examined this specimen; it is quite young, but there is no doubt that it is true *sphinx*.

LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ (in al.) 609, 631, 632 .. .. Asirgarh, Nimar.

(Also *see* Report No. 1.)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(Synonymy in No. 1.)

♂ 634, 638 (in al.), 641, 643, 652. ♀ 639 (in al.), 642, 653. Asirgarh, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

TAPHOZOUS THEOBALDI, Dobs.

Theobald's sheath-tailed Bat.

1872. *Taphozous theobaldi*, Dobson. P. A. S. B., p. 152.
1891. *Taphozous theobaldi*, Blanford. Mammalia, No. 219.

♂ 635, 644, 651 .. .. Asirgarh, Nimar.

This bat was described by Dobson on a specimen from Tenasserim. The British Museum has also a series from Java.

RHINOPOMA KINNEARI, Wrought.

The greater Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 646, 649, 650, 655 (in al.). ♀ 633, 636, 637, 645, 647, 648, 656 (in al.), 657, 658 (in al.).

(*See* also Report No. 3.)

PACHYURA, sp.

Shrews.

♂ 711. ♀ 715, 724 .. .. Chandghar, Nimar.
♂ 731. .. .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

PACHYURA STOLICZKANA, Anders.

Stoliczkas Shrew.

1877. *Crocidura stoliczkana*, Andersen. J. A. S. B. XLVI., p. 270.
1877. *Crocidura bidiana*, Andersen. J. A. S. B. XLVI., p. 276.
1888. *Crocidura bidiana*, Blanford. Mammalia, No. 120.

♀ 677 .. .. .. Hewra, Nimar.

If *stoliczkana* and *bidiana* are identical, clearly the former name must be accepted for the species. I record this identification with great misgiving.

PACHYURA PERROTTETI, Duvern.

The Indian pigmy Shrew.

1842. *Sorex perrotteti*, Devernoy. Mag. Zool., p. 29.
1855. *Sorex melanodon*, Blyth. J. A. S. B. XXIV., p. 33 (preoccupied.)
1855. *Sorex nudipes*, Blyth. l. c., p. 34.
1873. *Pachyura assamensis*, Andersen. P. Z. S., p. 232.
1877. *Crocidura macrotis*, Andersen. J. A. S. B. XLVI., p. 271.
1877. *Crocidura nitidofulva*, Andersen. l. c., p. 272.
1877. *Crocidura nilgirica*, Andersen. l. c., p. 274.
1877. *Crocidura travancorensis*, Andersen. l. c., p. 275.
1888. *Crocidura perrotteti*, Blanford. Mammalia, No. 125.

623. .. .. .. Asirgarh, Nimar.

Blanford ranks all these pigmy shrews in two species, *viz.*, *Hodgsoni* and *perrotteti*, the former including the sub-Himalayan forms and the latter all the rest. The material at present is insufficient to justify any more exact treatment.

FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♀ 597, 601	.. Asirgarh, Nimar.
♂ 666, 669, 670, 672. ♀ 674	.. Hewra, Nimar.
♂ 717	.. Chandgarh, Nimar.
♂ 756	.. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

[" *Felis affinis* was exceedingly common, and it was most noticeable that it was always on the move by day. Its movements can easily be followed by the piping of squirrels and the chirping of birds."—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(Synonymy in No. 1.)

♂ 659. ♀ 627 ..	.. Asirgarh, Nimar.
♂ 716	.. Chandgarh, Nimar.
♀ 728, 734	.. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

[" The Mongoose No. 728 was living in the trunk of a tree, the entrance being a narrow slit some 3 feet from the ground."—C. A. C.]

HYÆNA HYÆNA, L.

The striped Hyæna.

(Synonymy in No. 1.)

♂ 665. ♀ 663 ..	.. Asirgarh, Nimar.

(*See* also Reports Nos. 1 and 2.)

CANIS INDICUS, Hodgs.

The Jackal.

(Synonymy in No. 1 under *C. aureus.*)

738, 747 ..	.. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

(Synonymy in No. 2.)

♂ 654.	.. Asirgarh, Nimar.

(*See* also Report No. 2.)

Funambulus palmarum, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♂ 625 .. .. .. Asirgarh, Nimar.
♀ 683 .. .. .. Asirgarh, Nimar.
♀ 685, 691, 698, 699 .. Sival, Nimar.
♂ 735 .. .. .. Garoor, Nimar.

(*See* also Report No. 2.)

Funambulus pennanti, Wrought.

The common five-striped Squirrel.

(Synonymy in No. 1.)

♂ 626 .. .. Asirgarh, Nimar.
♀ 667, 668, 682 .. .. Hewra. Nimar.
♂ 720, 723, 721 (in al.) .. Chandghar, Nimar.
♂ 762, 765 .. .. .. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

["I have been observing them (*Funambulus pennanti*) for a week and have never heard the shrill piping note so frequently uttered by the Palm Squirrels. These Squirrels have a low chirping or rather twittering note; they are exceedingly shy; they appear much redder in colour than the Palm Squirrel; the stripes are narrow and in life the coat is very glossy and lies very close."—C. A. C.]

Tatera indica, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 621. ♀ 610, 611, 616 .. Asirgarh, Nimar.
♂ 660, 679. ♀ 661, 678 .. Hewra, Nimar.
♂ 689. ♀ 692 .. .. Sival, Nimar.
♂ 705. ♀ 706, 714.. .. Chandgarh, Nimar.

(*See* also Reports Nos. 1 and 2.)

Vandeleuria oleracea.

The Dekhan Tree-Mouse.

(Synonymy in No. 2.)

♂ 693. ♀ 694 .. .. Sival, Nimar,
♂ 718, 725 .. .. .. Chandgarh, Nimar.

(*See* also Report No. 2.)

Mus phillipsi, Wrought.

Phillips' spined Mouse.

1912. *Mus phillipsi*, Wroughton. Journ. B. N. H. Soc. Vol. XXI, p. 772.

♂ 618. Asirgarh, Nimar.

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This pretty little animal has, at first sight, a curiously close superficial resemblance to *Leggada platythrix*, but is really barely half the size of that species. The presence of frontal ridges on the skull add to this resemblance, but the dentition is so essentially that of *Mus* that its separation from *Leggada platythrix* cannot, for a moment, be in doubt.

Although the type was not taken in his District, I have great pleasure in naming it after Mr. R. M. Phillips, who has taken such great interest in the Field work of the Mammal Survey, and given such great assistance to our collector Mr. G. C. Shortridge.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(Synonymy in No. 1.)

♂ 612, 662 .. .. .. Asirgarh, Nimar.
♂ 676 .. .. Hewra, Nimar.

(*See* also Reports Nos. 1 and 2.)

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(Synonymy in No. 1.)

♂ 619, 622, 628 (in al.), 640. ♀ 604, 620 (in al.). Asirgarh, Nimar.
♂ 673, 675. ♀ 680 .. .. .. Hewra, Nimar.
♂ 688 .. .. Sival, Nimar.
♂ 703, 712, 719. ♀ 704, 713 .. Chandgarh, Nimar.
♂ 739. ♀ 736, 740, 741, 764 .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

MILLARDIA MELTADA.

The soft-furred Field Rat.

(Synonymy in No. 1.)

♂ 730, 748, 758, 766. ♀ 767. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

♂ 600. ♀ 598, 599 .. Asirgarh, Nimar.
♂ 681 (imm.) .. .. Hewra, Nimar.
♂ 684, 695 .. .. Sival, Nimar.
♀ 707 .. .. .. Chandgarh, Nimar.
♂ 726, 732, 746, 750, 753, 755. ♀ 727, 733, 749, 751, 752 Chandgarh, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

(Synonymy in No. 1.)

♂ 629. ♀ 605, 606, 607 .. .. .. Asirgarh, Nimar.
♀ 671 .. .. Hewra, Nimar.
♂ 686, 687, 690 .. .. Sival, Nimar.
♂ 709. ♀ 710 .. .. Chandgarh, Nimar.
♂ 744, 757, 760. ♀ 745, 754, 761 .. Garoor, Nimar.

(*See* also Report No. 1.)

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(Synonymy in No. 1.)

♂ 608, 614, 615, 624. ♀ 613, 617, 630 (in al.) Asirgarh Nimar.
♂ 696 .. .. Sival, Nimar.
♂ 759. ♀ 763.. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(Synonymy in Report No. 1.)

♂ 708 .. .. Chandgarh, Nimar.
♂ 729, 737, 743. ♀ 742 .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XV.

(Continued from page 131 of this Volume.)

EUCOSMIDÆ.

Hermenias, n. g.

Antennæ in ♂ ciliated, with excavated notch in stalk near base. Palpi moderate, porrected, second joint with dense rough projecting scales above and beneath, terminal joint moderate. Thorax without crest. Forewings with 7 and 8 stalked, 7 to apex or termen. Hindwings with 3 and 4 stalked or coincident, 5 closely approximated at base, 6 and 7 closely approximated towards base.

Type *epidola*, Meyr. from Australia.

Hermenias pachnitis, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax blackish mixed with white. Antennal notch of ♂ at $\frac{1}{4}$. Forewings elongate, posteriorly slightly dilated, costa slightly arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; 7 to termen: grey or dark grey ribbed with black; costa more or less obscurely strigulated with white irroration; an irregular patch of confused white marbling or strigulation occupying most of dorsal half from base to $\frac{2}{3}$ and thence extended as a fascia to costa before apex, including a more or less defined irregularly triangular spot of ground colour on middle of dorsum; a leaden-metallic whitish-edged erect mark from tornus, and a leaden-metallic streak along lower $\frac{3}{4}$ of termen: cilia grey sprinkled with whitish, basal half white with three or four blackish bars on upper half of termen. Hindwings with 3 and 4 coincident: thinly scaled, semi-transparent, dark grey: cilia dark grey, in ♂ on dorsum and tornus greatly elongated.

Maskeliya and Patipola, Ceylon (Pole, Green, Alston): in November, December, April and May, four specimens.

Hermenias implexa, n. sp.

♂ ♀. 14-16 mm. Head, palpi, and thorax rather dark fuscous, sometimes slightly whitish-sprinkled. Antennal notch of ♂ close above base. Forewings elongate, narrow, costa slightly arched, in ♂ with strong fold reaching from base to near middle, apex obtuse, termen indented-sinuate, rather oblique; 7 to termen; dark fuscous; a broad irregular streak of whitish irroration or suffusion along dorsum from base, occupying nearly half of wing, upper edge sinuate or angularly indented before middle, dorsal edge dotted with dark fuscous, separated from ocellus by a triangular tornal spot of ground colour; ocellus margined by two thick leaden-metallic streaks confluent beneath, sometimes whitish-irrorated, containing several irregular and variable black dots or short dashes; some oblique violet-leaden strigæ from costa posteriorly, rising from short obscure whitish strigulæ: cilia fuscous, with two or three series of white points. Hindwings with 3 and 4 coincident; grey, thinly scaled, veins dark fuscous, termen suffused with dark fuscous, more broadly towards apex; cilia light fuscous, with darker subbasal shade, tips whitish-tinged, in ♂ elongated on tornus and dorsum.

Namunakuli and Patipola, Ceylon (Green): from February to May, eight specimens.

Hermenias palmicola, n. sp.

♂ ♀. 11-12 mm. Head, palpi, and thorax fuscous. Antennal notch of ♂ close above base. Forewings elongate, narrow, somewhat contracted posteriorly, costa gently arched, in ♂ with strong fold reaching from base to beyond middle, apex obtuse, termen somewhat sinuate-indented beneath apex, rather oblique; 7 to termen; dark fuscous; dorsal half mostly covered with suffused transverse strigæ of whitish irroration; a pale leaden-grey erect striga from tornus, and a streak along termen: some oblique obscure purplish-leaden strigæ from costa posteriorly, rising from short strigulæ of whitish irroration; between these and terminal leaden streak is a narrow patch of fine scattered whitish hairscales; a small distinct white mark on costa before apex: cilia fuscous irrorated with whitish and somewhat sprinkled with dark fuscous. Hindwings with 3 and 4 coincident; thinly scaled, semitransparent, grey; veins dark fuscous; termen suffused with dark fuscous, more broadly towards apex; cilia fuscous sprinkled with whitish, in ♂ elongated on tornus and dorsum.

Trincomali, Puttalam, and Batticaloa, Ceylon (Green, Fletcher, Pole); in May, June and October, three specimens. Very like *implexa*, but smaller, without the defined triangular dark spot before tornus, and structurally distinct by the longer costal fold; it is a low-country species, whilst *implexa* occurs at high elevations only.

Spilonota, Steph.

This generic name supersedes *Tmetocera*, Led. and *Strepsicrates*, Meyr. I have described three Indian species, *S. rhothia*, which also occurs in Mauritius, *S. calcata* and *S. melanacta*, the antennal structure in the last-named having been overlooked; and now add four more.

Spilonota meleanocopa, n. sp.

♂ ♀. 15-17 mm. Head, palpi, and thorax dark grey sprinkled with white. Antennal notch of ♂ at $\frac{1}{5}$. Forewings elongate in ♂, rather narrow, costa slightly arched, in ♂ faintly sinuate beyond middle, with broad fold extending from base to beyond middle, apex obtuse, termen straight, somewhat oblique; dark grey, coarsely and suffusedly strigulated with white; in ♂ a blackish patch on costa beyond middle; a black longitudinal mark in middle of disc, in ♀ slight and broken; a triangular blackish prætornal spot; ocellus margined by silvery-metallic streaks, and containing two or three black dots; a transverse black mark resting on middle of termen: cilia dark fuscous mixed and irrorated with whitish. Hindwings with 3 and 4 stalked; dark fuscous, thinly scaled, especially towards base, more so in ♂; cilia fuscous, towards tips whitish-sprinkled.

Khasis; in June, six specimens.

Spilonota algosa, n. sp.

♂ ♀. 12-15 mm. Head and thorax dull olive-greenish, mixed with dark fuscous or blackish. Palpi whitish-greenish, spotted or barred with blackish. Antennal notch of ♂ close above base. Forewings elongate posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; dull olive-green, with some iridescent-whitish scales and some scattered blackish strigulæ; costa black, with pairs of whitish strigulæ; basal patch strigulated with black, and with outer edge formed by a fascia of black suffusion, acutely angulated below middle; central fascia more or less irregularly suffused with black, acutely angulated in middle; two or three bluish-leaden-metallic oblique strigæ from costa posteriorly; a blackish prætornal spot, tending to be confluent with a blackish blotch before middle of termen, both limited posteriorly by blue-leaden-metallic streaks; apex black; a fine black terminal line: cilia olive-greenish mixed or obscurely barred with blackish. Hindwings with 3 and 4 stalked; thinly scaled, grey, with violet-blue iridescence; veins dark fuscous; cilia grey.

Khasis; in August and September, fourteen specimens.

Spilonota babylonica, n. sp.

♂. 15 mm. Head and thorax white, shoulders dark grey. Palpi grey, edges sprinkled with white. Antennal notch very near base. Forewings elongate, costa gently arched, without fold, apex obtuse, termen hardly sinuate, oblique; ochreous-white, base of scales pale greyish; costa and dorsum dotted with dark fuscous; a grey patch marked with dark fuscous extending along basal fourth of costa; a semioval grey blotch on middle of costa, reaching half across wing, marked with dark fuscous and discal edge suffused with black; a grey triangular prætornal spot; two or three black strigulæ on termen: cilia grey mixed with dark fuscous. Hindwings with 3 and 4 stalked; thinly clothed with blackish-grey scales, membrane with strong violet-blue iridescence; cilia grey-whitish, with greyer sub-basal shade, on dorsum long.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen.

Spilonota aestuosa, n. sp.

♂. 17-21 mm. Head and thorax olive-greenish marked with dark fuscous. Palpi ochreous-whitish, second joint with apical bar and two spots dark fuscous. Antennal notch close above base. Forewings elongate, posteriorly slightly dilated, costa gently arched, with rather narrow fold extending from base to beyond middle, apex obtuse, termen sinuate, somewhat oblique; dull olive-greenish, mixed or strigulated with dark fuscous; a large blackish blotch extending along costa, from base to 3/5, and reaching 3/4 across wing, lower edge with a triangular emargination beneath middle of wing edged with white anteriorly, posterior edge rather oblique, with two acute projections, edged with leaden-metallic; a subtriangular black prætornal spot edged with leaden-metallic; costa posteriorly black with pairs of whitish strigulæ, giving rise to two oblique leaden-metallic strigæ and a blackish striga between them; a leaden-metallic streak close before termen in middle, preceded by a blotch of blackish suffusion: cilia olive-greenish, mixed with dark fuscous round apex and upper part of termen. Hindwings with 3 and 4 stalked; fuscous, veins and termen dark fuscous cilia fuscous.

Darjiling; Khasis; in May and August, two specimens.

Crusimetra, n. g.

Antennæ in ♂ minutely ciliated. Palpi moderate, porrected, second joint with rough projecting scales above and beneath, terminal joint short. Thorax with small posterior crest. Forewings with 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 connate, 5 approximated at base, 6 and 7 stalked.

Crusimetra verecunda, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax grey or dark grey, sprinkled with whitish. Forewings elongate, costa gently arched, in ♂ without fold, apex obtuse, termen sinuate, somewhat oblique; ochreous-brown or ferruginous-brown, variably irrorated or suffused (sometimes wholly) with dark grey whitish-tipped scales, apex and terminal area usually but not always remaining brown; a more or less marked spot of blackish irroration or suffusion towards dorsum before middle: cilia blackish, with some whitish points. Hindwings ochreous-grey-whitish or whitish-grey-ochreous, suffused with grey towards apex; cilia ochreous-whitish, with two grey shades.

Namunakuli, Ceylon (Green); in February, six specimens.

Acroclita, Led.

This name supersedes *Rhopobota*, Led. I have described one species, *A. physalodes*, which occurs in Ceylon and the Chagos Islands, and now record thirteen more, one of which is a well-known European species.

Acroclita clivosa, n. sp.

♂. 13-14 mm. Head white, sides of crown tinged with ochreous-brownish. Palpi fuscous, terminal joint and apex of second white. Thorax white suffused on sides with ochreous-brown, with two posterior blackish bars. Abdomen black at base beneath. Forewings elongate, costa gently arched, without fold, apex round-pointed, prominent, termen abruptly concave-indented beneath it, then somewhat obliquely rounded ; 3 and 4 closely approximated throughout, 6 closely approximated to 7 ; grey suffusedly irrorated with white ; costa dark fuscous, with pairs of whitish strigulæ ; basal patch irregularly suffused with brown, more or less strigulated with blackish, on dorsum reaching to middle, outer edge obtusely angulated below middle ; central fascia slender, ochreous-brown, not reaching dorsum, crossed in middle by a black streak extended almost to apex ; some blue-leaden strigæ from costa posteriorly ; ocellus enclosed by two leaden-metallic streaks : cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked ; pale grey-darker at apex : cilia pale grey, costal cilia thickened. Forewings on undersurface with rather broad suffused dark fuscous streak along costa from base to near apex.

Khasis ; in October, two specimens.

Acroclita cheradota, n. sp.

♂ ♀. 10-11 mm. Head and thorax light ochreous. Palpi pale, ochreous, hairs beneath suffused with whitish. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen concave beneath it ; light brownish-ochreous, with strong violet purple iridescence, irrorated with ferruginous-brownish except towards costa anteriorly ; a blotch of irregular blackish strigulation extending on dorsum from near base to middle, and reaching more than half across wing ; costa finely strigulated with blackish ; an oblique suffused ferruginous-brown mark from costa beyond middle ; some ferruginous-brown suffusion on costa towards apex, including a whitish strigula near apex, sometimes followed by a blackish dot, apical prominence margined beneath with whitish : cilia brownish-ochreous, beneath apex with a whitish bar. Hindwings with 3 and 4 stalked ; grey, thinly scaled in disc, darker on veins and posteriorly ; cilia grey.

Puttalam, Ceylon (Pole); Pusa (Lefroy) ; in March and April, two specimens. Larva feeding in rolled leaves of *Ficus religiosa (Lefroy).*

Acroclita grypodes, n. sp.

♂. 17 mm. Head pale ochreous, face ochreous-whitish. Palpi greyish-ochreous, terminal joint and apex of second whitish. Thorax brownish, with whitish-ochreous dorsal stripe edged with dark fuscous. Forewings elongate, costa gently arched, without fold, apex falcate-prominent, termen semicircularly excavated beneath it ; ochreous-brown ; costal edge dark fuscous, with fine obscure oblique strigulæ of whitish irroration ; a darker brown longitudinal band from base of dorsum to apex of wing, edged above with ochreous-whitish suffusion from before middle to near apex ; dorsum dotted with blackish ; a streak of whitish suffusion along dorsum from base to beyond middle, where it turns slightly upwards, edged above with a streak of dark fuscous suffusion which is continued beyond it along dorsum to beyond tornus; some ochreous-whitish irroration or suffusion posteriorly between this and median band: cilia fuscous somewhat sprinkled with ochreous-whitish, with patches of dark fuscous suffusion at apex and below middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous; on undersurface with a narrow elongate subcostal patch of blackish modified scales extending from $\frac{1}{4}$ to beyond middle.

Maskeliya, Ceylon (Pole); in May, one specimen.

Acroclita scleropa, n. sp.

♂ ♀. 15-16 mm. Head and thorax greyish more or less tinged with brown, thorax anteriorly suffused with blackish. Palpi dark fuscous. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen abruptly concave-indented beneath it; grey suffusedly irrorated with whitish; costa blackish, with pairs of fine whitish strigulæ; basal patch brownish, irregularly strigulated with blackish, reaching on dorsum to middle and suffused with blackish towards dorsum posteriorly, outer edge angulated in middle; central fascia narrow, oblique, upper half blackish, lower half ochreous-brownish, posterior edge with an abrupt black projection in middle; apical area ochreous-brown, with several oblique leaden-metallic strigæ from posterior half of costa, and a black elongate mark towards costa above ocellus; ocellus ochreous-brown, margined by two thick leaden-metallic streaks, and containing a black dash near lower extremity: cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked; grey, veins darker; in ♂ beneath an elongate-ovate patch of blackish modified scales extending beneath costa from near base to $\frac{2}{3}$; cilia light fuscous, with darker subbasal shade.

Namunakuli, Patipola, and Maskeliya, Ceylon (Green, Pole, Alston); from January to April, five specimens.

Acroclita naevana, Hb.

Maskeliya, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); Khasis; in May, June, and from October to December, ten specimens. Occurs also throughout Europe and Central Asia to Japan. On the undersurface of both wings the colouring is darker in Indian examples than in European, so that the patch of black suffusion on the hindwings of ♂ stands out less conspicuously; otherwise I can detect no difference, and the specific identity is undoubted.

Acroclita symbolias, n. sp.

♂ ♀. 13-14 mm. Head white, sides fuscous. Palpi fuscous, terminal joint and apex of second white. Thorax brown, with pale grey central stripe. Forewings elongate, costa gently arched, apex round-pointed, prominent, termen abruptly concave-indented beneath it; pale greyish, faintly greenish-tinged; costa strigulated with dark fuscous; rounded-quadrate dark grey spots on costa representing edge of basal patch and extremity of central fascia, between these a white patch reaching half across wing; dorsal half of basal patch suffused with brown and dark fuscous, extending to beyond middle, outer edge angulated below middle; from its angle a streak of greenish-grey and brownish suffusion runs to apex, marked with two black dashes; ocellus brownish marked in middle with black, margined with thick leaden-grey marks becoming white above; a brown mark along middle of termen: cilia dark leaden-grey irrorated with white, towards base white. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Khasis; in August and October, two specimens.

Acroclita belinda, n. sp.

♂ ♀. 11-13 mm. Head white. Palpi dark grey, terminal joint and apex of second white. Thorax ochreous-whitish, anterior half blackish. Forewings elongate, rather narrow, costa slightly arched, without fold, apex round-pointed, termen sinuate, rather oblique; green mixed with iridescent-white; basal $\frac{2}{3}$ suffused with blackish except a broad dorsal pale ochreous streak with upper edge triangularly prominent beyond middle and terminated by a triangular blackish prætornal spot; costa posteriorly black, with four pairs of white strigulæ; two or three black dashes towards apex; ocellus margined laterally with iridescent-white: cilia blackish irrorated with whitish. Hindwings with 3 and 4 connate; grey; cilia light grey, sprinkled with whitish.

Khasis; in July and August, two specimens.

Acroclita esmeralda, n. sp.

♂ ♀. 9-10 mm. Head and thorax pale emerald-green, thorax spotted with black and white. Palpi white, spotted with black. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, somewhat oblique; pale emerald-green strigulated with black; a black subquadrate spot on costa at $\frac{1}{3}$; a large irregular-edged triangular blackish blotch extending over dorsum from $\frac{1}{4}$ to tornus and reaching to middle of costa; costal area posteriorly blackish, with four pairs of whitish strigulæ giving rise to oblique leaden-metallic strigæ; ocellus emerald-green, edged with silvery-whitish, and crossed by three or four black dashes; a black terminal line: cilia pale greenish, round apex with black subbasal line, above apex blackish. Hindwings with 3 and 4 long-stalked; rather dark grey, thinly scaled in disc, veins and apical suffusion darker; cilia grey, tips paler.

Khasis; in October, two specimens.

Acroclita corinthia, n. sp.

♂ ♀. 13-15 mm. Head and thorax rather dark fuscous irrorated with pale ochreous. Palpi fuscous, obscurely spotted with whitish-ochreous suffusion. Forewings elongate, posteriorly slightly dilated, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; fuscous, irrorated with whitish or whitish-ochreous, and strigulated with blackish; costa blackish, before middle with two, and beyond it with five pairs of whitish strigulæ, giving rise to more or less marked blue-leaden-metallic striæ, those from posterior half very oblique, and subcostal space between them more or less ferruginous; basal patch brownish strigulated with black, outer edge angulated below middle, little marked: central fascia slender, brown, strigulated with black, little defined; ocellus obscurely margined with blue-leaden metallic: cilia brownish sprinkled with whitish, variably marked with dark fuscous, especially at apex. Hindwings with 3 and 4 stalked; fuscous, very thinly scaled, semi-hyaline, with violet-purple reflections, in ♀ darker posteriorly; veins blackish; in ♂ on undersurface with a black patch along costa, from base to beyond middle, costal edge on this furnished with very long fine hairs; cilia grey, darker towards base.

Maskeliya, Ceylon (Pole, Green, Alston); Khasis; in May, and from October to December, five specimens. The characteristic hindwings distinguish this species.

Acroclita zeaera, n. sp.

♂ ♀. 12-13 mm. Head grey-whitish. Palpi whitish, second joint mostly occupied by three dark fuscous spots. Thorax olive-greenish mixed with black and white. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; dull olive-green suffusedly strigulated with white; markings margined and irregularly strigulated with black; basal patch represented by blotch at base and angulated fascia beyond it: central fascia moderate, oblique, interrupted below middle; costa posteriorly blackish, with four pairs of whitish strigulæ, giving rise to oblique purplish-leaden strigæ; ocellus margined laterally by purplish-leaden streaks mixed with whitish, and surmounted by a blackish spot; a black terminal line: cilia olive-greenish, outer half dark grey irrorated with whitish, round apex wholly blackish-irrorated. Hindwings with 3 and 4 stalked; dark grey, thinly scaled in disc; cilia rather dark grey. Forewings on undersurface in ♂ suffused with blackish on costal half from base to beyond middle.

Maskeliya, Ceylon (Pole); in May and June, two specimens.

Acroclita chlorissa, n. sp.

♂ ♀. 12-14 mm. Head and thorax green, shoulders suffused with blackish. Palpi green, obscurely spotted with blackish. Forewings elongate, posteriorly rather dilated, costa slightly arched, in ♂ with narrow fold extending from base to $\frac{2}{5}$, apex round-pointed, termen sinuate, somewhat oblique; green; markings obscurely edged with iridescent-whitish;

triangular spots suffusedly outlined with black at base, on costa at $\frac{1}{4}$, and on dorsum at $\frac{1}{3}$; a blackish blotch on middle of costa, reaching half across wing, adjoining which beneath is a spot outlined with black; a small blackish spot on costa beyond this; a transverse blackish blotch from costa beyond $\frac{1}{2}$, reaching more than half across wing; a triangular spot on dorsum suffusedly outlined with black, sometimes almost touching this; a small black apical spot; a black terminal line: cilia green, with blackish apical spot. Hindwings with 3 and 4 very long-stalked; grey; cilia light grey, more whitish towards tips.

Khasis; in October, three specimens.

Acroclita multiplex, n. sp.

♀. 14-16 mm. Head white. Palpi dark fuscous, terminal joint and apex of second white. Thorax white mixed with light grey, shoulders spotted with dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, somewhat oblique; white, with some transverse leaden-grey marks, especially towards dorsum; costa strigulated with blackish; a dark grey basal fascia marked with black; a dark grey black-edged spot on costa at $\frac{1}{4}$; a dark grey black edged blotch on dorsum at $\frac{1}{3}$, reaching half across wing; a slender oblique dark fuscous streak from middle of costa not reaching half across wing; a dark fuscous transverse blotch from dorsum before ocellus, marked with black and a brown spot, reaching more than half across wing; ocellus broadly margined with leaden-metallic, containing four short black marks adjacent to its posterior edge, separated with brownish, and surmounted by a semicircular blackish blotch; posterior half of costa with small blackish marks terminated beneath with ferruginous, alternating with strigulæ terminated with leaden-metallic; a leaden-metallic striga before apex; a black apical mark edged above with ferruginous-brown and beneath with white: cilia grey irrorated with white. Hindwings with 3 and 4 stalked; grey; cilia pale grey, with darker subbasal line.

Patipola and Ohiya, Ceylon (Pole, Green); in April and November, two specimens. Superficially extremely like *Eucosma cremnitis*, but smaller and apart from the differences in neuration, readily distinguished by the white head and apical portion of palpi.

Acroclita thysanota, n. p.

♂. 15-16 mm. Head and thorax dull olive-greenish, thorax somewhat strigulated with blackish. Palpi dull olive-greenish spotted with blackish. Abdomen with long whitish apical hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen straight, rather oblique; dull olive-greenish, strigulated with black except towards costa on posterior $\frac{2}{3}$; costal edge black with pairs of whitish strigulæ; a black spot on costa before $\frac{1}{3}$; a very oblique transverse black spot from middle of costa; posterior area of wing crossed by irregular leaden-metallic strigæ, two of these enclosing a narrow ocellus marked with black, and preceded by a triangular blackish prætornal spot: cilia olive-greenish with some obscure dark fuscous and whitish bars, above apex blackish. Hindwings with 3 and 4 stalked; grey with prismatic-violet iridescence, thinly scaled; cilia whitish-grey, on dorsum and tornus much elongated to form a dense projecting pale ochreous hair pencil.

Khasis; in November, two specimens.

Ancylis carpalima, n. sp.

♂ ♀. 11-15 mm. Head whitish, more or less ochreous-tinged on crown. Palpi fuscous, terminal joint and long hairs of second white. Thorax brownish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex falcate, termen semi-circularly excavated beneath it; ferruginous-brownish or ferruginous-ochreous, variably mixed or obscurely streaked longitudinally with whitish; costa obliquely strigulated with blackish and whitish; dorsum dotted with dark fuscous; a more or less marked suffused whitish line along submedian fold, dorsal area within this sometimes suffused with dark brown; a more or less marked very oblique dark brown streak from middle of costa, costal area beyond this sometimes suffused with dark brown; a variably developed longitudinal patch of brown suffusion streaked with dark fuscous from middle of disc to near termen, and sometimes posterior area much suffused with dark brown; apical projection dark brown or ferruginous, edged anteriorly and beneath with white: cilia brown, variably sprinkled or largely suffused with white. Hindwings with 3 absent, tornus in ♂ rather prominent; rather dark grey, somewhat thinly scaled in disc; cilia grey or whitish-grey, round apex tinged with ochreous or fuscous.

Kandy, Ceylon (Green); N. Coorg, 3,500 feet (Newcome); Khasis; from August to November, ten specimens. Also occurs in Queensland, Australia. The markings are variable and confused; the dark brown colouring is more developed in specimens from Coorg and Ceylon than in those from the Khasis and Australia, but there is no constant difference.

Ancylis scatebrosa, n. sp.

♀. 13-14 mm. Head ochreous-whitish, forehead somewhat mixed with brownish. Palpi with long hairs, ochreous-whitish, second joint with spot of dark fuscous suffusion towards apex. Thorax ochreous-whitish marked with ferruginous-brown. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex falcate, termen concave; ochreous-whitish crossed throughout by irregularly anastomosing brownish-ochreous striæ, suffused with dark fuscous; posterior half of costa dark fuscous strigulated with white, subcostal space beneath this light ochreous, traversed by a very oblique leaden-metallic striga; a fine black terminal line: cilia light brownish-ochreous, with a blackish subbasal dot beneath apex, and more or less marked blackish subbasal shade on lower half of termen. Hindwing with 3 and 4 stalked; rather light grey; cilia whitish-grey, with darker subbasal shade.

Khasis; in June, two specimens.

Ancylis rostrifera, n. sp.

♂. 11-12 mm. Head rather dark fuscous. Palpi dark fuscous, terminal half white. Thorax fuscous mixed with white posteriorly, shoulders marked with blackish. Forewings elongate, costa rather strongly arched anteriorly, slightly sinuate posteriorly, apex falcate, termen strongly excavated beneath it; ochreous-white, dorsal half mixed with leaden-grey; costa anteriorly marked with small scattered blackish spots; lower half of basal patch formed by four irregular transverse blackish or dark fuscous marks; posterior area from beyond middle to near termen largely suffused with ferruginous-brown, somewhat mixed with blackish and posteriorly marked with leaden-metallic, its costal edge black strigulated with white, more strongly black posteriorly; terminal area white spotted with leaden-metallic, with a black terminal line, apex ferruginous-brown: cilia ochreous whitish. Hindwings with 3 and 4 stalked; grey, thinly scaled in disc; cilia grey, tips paler.

Maskeliya, Ceylon (Pole); in October, two specimens.

Ancylis ancorata, n. sp.

♀. 12-13 mm. Head pale brownish-ochreous, forehead mixed with blackish, face mixed with blackish and margined with whitish. Palpi with long hairs, whitish, spotted with blackish suffusion. Thorax brownish-ochreous. Forewings elongate, costa gently arched, apex falcate-prominent, termen abruptly concave beneath it; ochreous-brown, suffused with whitish-ochreous towards anterior half of costa; costa strigulated with black and on posterior half with whitish; a grey slightly brownish-tinged streak, edged above by a pale or whitish-tinged line, running along dorsum from $\frac{1}{3}$ to tornus and continued to middle of termen, dilated on tornus and termen, marked with some blackish suffusion before tornus; a triangular leaden-metallic mark before termen resting on extremity of this streak; sometimes a few black scales in disc towards middle; a leaden-metallic striga from $\frac{2}{3}$ of costa to near termen beneath apex; a white strigula on costa near apex, and a leaden-metallic terminal mark beneath it: cilia whitish-ochreous, above apex ochreous-brown, beneath it with spot of whitish suffusion. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Kegalle, Ceylon (Alston); Konkan (Young); three specimens.

Herpystis pallidula, n. sp.

♂♀. 10-14 mm. Head white. Palpi white, basal half infuscated. Thorax ochreous whitish. Forewings elongate, somewhat contracted posteriorly, costa gently arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; ochreous-whitish or pale whitish-ochreous, with scattered strigulæ of dark fuscous irroration except toward base; costa obliquely strigulated throughout with black; an undefined spot of black irroration on fold indicating angle of basal patch; a narrow ochreous patch along posterior half of costa, marked with four pairs of whitish costal strigulæ and some very oblique leaden-metallic strigæ from these; ocellus obscurely margined with leaden-metallic, enclosing some scattered black scales: cilia whitish-ochreous. Hindwings pale greyish; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); from October to December, six specimens.

Gypsonoma, Meyr.

This genus is essentially distinguished from *Eucosma* by the stalking of veins 6 and 7 of hindwings.

Gypsonoma anthracitis, n. sp.

♂ ♀. 10-11 mm. Head, palpi, and thorax in ♂ wholly dark grey, posterior extremity of thorax whitish; in ♀ head white, crown suffused with grey, dark fuscous on sides, palpi dark fuscous, with terminal joint and apex of second white, thorax dark grey mixed with white posteriorly, patagia white except shoulders. Abdomen in ♂ with long grey hairs from each side of back near base. Posterior tibiæ in ♂ clothed with rough whitish scales above. Forewings elongate, rather narrow, somewhat contracted posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, rather strongly oblique; ochreous-white, somewhat sprinkled with grey; basal patch suffused with grey, with three or four blackish-grey striæ, outer edge very obtusely angulated below middle; central fascia and posterior area wholly suffused with grey, irregularly and sharply marked with black, costa finely strigulated with whitish, giving rise to some oblique leaden-metallic strigæ, ocellus leaden-grey edged with white: cilia whitish mixed with grey and dark fuscous (imperfect). Hindwings narrower than forewings, 3 and 4 stalked; dark grey, thinly scaled anteriorly; in ♂ a brush of long dense dark grey hairs from anterior half of costa; undersurface in ♂ with dorsal area broadly blackish, costal edge with rough projecting white scales anteriorly; cilia long, grey, in ♂ on dorsum forming an expanded rough fringe of very long hairs. Undersurface of forewings in ♂ suffused with dark grey towards costa, with ridge of projecting scales overhanging upper margin of cell.

Maskeliya, Ceylon (de Mowbray); in May, two specimens.

Eucosma, Hb.

The genera *Cydia* and *Notocelia* are now merged in this.

Eucosma celerata, n. sp.

♂. 9-10 mm. Head dark fuscous, back of crown and lower part of face suffused with whitish. Palpi dark fuscous, apical half white. Thorax white, shoulders with a dark fuscous spot. Forewings elongate, narrow, costa gently arched, apex round-pointed, prominent, termen concave, oblique ; ochreous-white, with a few scattered dark grey strigulæ ; costa strigulated with black ; a semi-oval dark fuscous blotch extending along dorsum from near base to beyond middle, and reaching half across wing ; a triangular dark fuscous blotch on costa beyond middle, not reaching half across wing ; ocellus preceded and followed by some undefined leaden-grey suffusion ; a blackish irregular mark above it ; a triangular black apical spot extending into cilia, edged beneath with white : cilia ochreous-white. Hindwings with 3 absent ; grey ; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); in May and December, three specimens.

Eucosma semicurva, n. sp.

♀. 15-16 mm. Head and thorax ochreous-white, thorax with a black posterior spot. Palpi blackish, terminal joint and upper part of second joint posteriorly white. Forewings elongate, costa gently arched, apex obtuse, termen slightly sinuate, somewhat oblique ; ochreous-white, with a few scattered black strigulæ, costa with several small black spots or strigulæ ; a semi-circularly curved black streak with extremities resting on costa near base and at ¼ ; a black spot on middle of costa ; a black spot on dorsum near base, a rather larger one before middle, and a third rounded-triangular before tornus ; a rather irregular slender black streak along upper part of termen : cilia blackish-grey on tornus with a whitish patch, beneath this black. Hindwings with 3 and 4 stalked ; rather dark grey ; cilia whitish-grey, with grey subbasal line.

Khasis ; in June, two specimens.

Eucosma cremnitis, n. sp.

♂ ♀. 13-21mm. Head, palpi, and thorax grey or fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, in ♂ with short fold not reaching ¼, apex round-pointed, termen sinuate, somewhat oblique: white, with some scattered grey strigulæ ; costa strigulated with dark fuscous, a small dark fuscous spot on costa at ¼ ; a dark fuscous fascia extending from base of costa along dorsum to middle, posteriorly dilated into a blotch reaching half across wing and marked above with black: beyond this some grey suffusion, and then a dark fuscous transverse blotch before ocellus reaching more than half across wing and marked with black and a brown spot ; ocellus edged with leaden-metallic, containing three black marks adjoining its posterior edge, and surmounted by a dark fuscous blotch suffused with black above ; posterior half of costa with small dark fuscous marks terminated beneath with ferruginous-brown alternating with dark fuscous strigulæ terminated with leaden-metallic ; a leaden-metallic striga before apex ; a black apical mark edged above with ferruginous-brown and beneath with white : cilia grey with rows of white points, basal half suffusedly barred with whitish. Hindwings with 3 and 4 stalked ; grey, veins dark fuscous ; cilia grey.

Horton Plains and Maskeliya, Ceylon (Green, Pole, Fletcher); Palnis, 6,000 feet (Campbell); in August, and from March to May, twelve specimens.

Eucosma legitima, n. sp.

♂ ♀. 14-15 mm. Head white, sides of crown sometimes dark fuscous. Palpi dark fuscous, terminal joint and apex of second white. Thorax whitish, with blackish spots on shoulders and each side of back. Posterior tibiæ in ♂ with rough greyish hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen faintly sinuate, somewhat oblique: white or ochreous-white, with some scattered grey scales; upper half of basal patch dark grey marked with black; a subtriangular black blotch on dorsum before middle, and a smaller one before ocellus; ocellus yellow-ochreous, edged with leaden-metallic, and surmounted by a blackish blotch: posterior half of costa narrowly black with pairs of whitish strigulæ, space beneath this suffused with yellow-ochreous and crossed by oblique leaden-metallic strigæ; apex blackish: cilia ochreous-whitish, with a dark fuscous spot above apex and two on middle of termen. Hindwings with 3 and 4 stalked; rather dark grey; cilia grey.

Khasis; in April, and from August to November, six specimens.

Eucosma solidata, n. sp.

♂ ♀. 11-13 mm. Head rather dark fuscous, face in ♂ whitish. Palpi dark fuscous, terminal joint and apex of second white. Thorax grey mixed with blackish, suffused with black anteriorly. Forewings elongate, somewhat dilated posteriorly, costa gently arched, in ♂ without fold, apex round-pointed, termen sinuate, little oblique, more so in ♀; ochreous-whitish; basal patch leaden-grey marked with black, outer edge obtusely angulated below middle; a transverse series of blackish strigulæ beyond this, and two or three on costa; central fascia narrow, oblique, blackish or dark fuscous, tending to be interrupted below middle, preceded by some leaden-metallic marks, posterior edge with an abrupt black projection in middle; ocellus edged with leaden-metallic and containing four black dots; posterior half of costa black with four pairs of whitish strigulæ terminating in leaden-metallic marks, space between these brownish or fuscous; a spot of blackish suffusion above ocellus, tending to connect with middle of termen; apex blackish: cilia fuscous mixed with dark fuscous and sprinkled with whitish, towards tornus suffused with whitish. Hindwings with 3 and 4 stalked; fuscous, in ♀ darker; cilia whitish-grey, with grey subbasal line.

Khasis; in April and July, three specimens.

Eucosma calligrapha, n. sp.

♂ ♀. 17-19 mm. Head and thorax bronzy-ochreous mixed with dark fuscous. Palpi pale ochreous, terminal joint and three suffused spots of second joint dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen faintly sinuate, vertical; light ochreous; costa on anterior half strigulated with blackish and whitish, on posterior half blackish with five white strigulæ with leaden-metallic tips; a leaden-metallic stria from costa beyond middle almost to termen beneath apex; basal ¾ of wing crossed by oblique leaden-metallic and black striæ not reaching costa; a triangular blackish prætornal spot; ocellus margined with leaden-metallic and crossed by several black bars, surmounted by some blackish suffusion; a blackish mark on middle of termen: cilia pale ochreous, with dark leaden-fuscous patches at apex and on middle of termen, and sometimes other bars. Hindwings with 3 and 4 connate: dark fuscous; cilia whitish-fuscous, with dark fuscous subbasal line.

Khasis; Dawna Hills, Burma (Annandale); from August to October, and in March, eight specimens. Allied to *isogramma* and *speculatrix*.

Eucosma melanoneura, n. sp.

♂ ♀. 13-15 mm. Head and thorax light greyish-ochreous, face and dorsal area of thorax in ♀ suffused with blackish. Palpi pale greyish; whitish towards apex and above. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, little oblique; brownish, suffusedly irrorated with grey whitish-tipped scales; costa obscurely strigulated with blackish and whitish, on posterior half giving rise to some indistinct oblique leaden-greyish strigæ; some narrow dark fuscous suffusion along dorsum from base to near middle, and on a patch before tornus; ocellus edged with two obscure leaden-metallic streaks; a small ferruginous-brown apical spot. Cilia brownish with several suffused blackish lines and some whitish points, base whitish. Hindwings with 3 and 4 stalked; subhyaline, with violet-purple iridescence, apex and termen suffused with rather dark grey; veins in ♂ black, in ♀ dark fuscous; cilia pale bluish-grey, darker towards base. Undersurface of forewings in ♂ with blackish subcostal suffusion from base to beyond middle, and blackish streak along lower margin of cell.

Khasis; in October and November, two specimens.

Eucosma cyanopis, n. sp.

♂. 14-15 mm. Head light greyish-ochreous. Palpi ochreous-whitish, second joint spotted with dark grey suffusion. Thorax pale greyish-ochreous spotted with blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; pale ochreous irregularly mixed with grey and white; a large black patch overlaid with deep indigo-blue extending along costa from base to beyond middle and reaching to near dorsum, lower edge triangularly emarginate before middle of wing, posterior edge oblique-convex; costa posteriorly strigulated with black and white, giving rise to two or three oblique leaden-metallic strigæ; an irregular streak of blackish suffusion running from lower angle of costal patch to apex ; ocellus obscurely edged with leaden-metallic and marked with blackish ; a black terminal line : cilia pale ochreous mixed with grey and sprinkled with whitish. Hindwings with 3 and 4 stalked ; grey, thinly scaled, with violet reflections, veins and termen dark fuscous ; cilia grey, tips whitish.

Khasis ; in September and October, two specimens.

Eucosma ludicra, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax light yellow-ochreous. Forewings elongate, somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique ; light yellow-ochreous, in and above cell suffused with ferruginous-brown, veins posteriorly marked with ferruginous-brown lines ; costa indistinctly strigulated with ferruginous-brown, whitish-sprinkled on interspaces ; some more or less developed dark fuscous strigulation about submedian fold from near base to before middle ; a silvery-metallic transverse mark before median portion of termen preceded by three short blackish dashes ; an oblique silvery-metallic mark before apex : cilia whitish-ochreous sprinkled with ferruginous-ochreous. Hindwings with 3 and 4 stalked ; grey, in ♂ paler ; cilia whitish, dorsum in ♂ clothed with long rough expanded blackish bristly hairs.

N. Coorg, 3,500 feet (Newcome) ; in November, four specimens.

Eucosma spicea, n. sp.

♂. 13 mm. Head and palpi whitish-ochreous, second joint of palpi with a faint fuscous spot. Thorax ochreous. Posterior tibiæ and basal joint of tarsi densely tufted with whitish hairs, posteriorly suffused with light greyish. Forewings elongate, moderate, posteriorly dilated, costa slightly arched, without fold, apex obtuse, termen rounded, somewhat oblique ; pale ochreous ; costa strigulated with blackish and whitish ; a broad suffused ferruginous median streak from base to end of cell and thence to apex, sprinkled with blackish posteriorly, terminal area of wing suffused with light ferruginous ; two or three oblique leaden-metallic strigæ from posterior half of costa ; leaden-metallic marks on middle of termen and tornus ; cilia whitish-yellowish, with ochreous subbasal line. Hindwings with rather contorted subdorsal fold, 3 and 4 stalked ; dark grey, towards base lighter and thinly scaled ; cilia pale grey, with dark grey subbasal line.

Khasis ; in June, one specimen.

Eucosma litigiosa, n. sp.

♂ ♀. 20-22 mm. Head and thorax grey mixed with dark fuscous and sprinkled with whitish. Palpi dark fuscous sprinkled with whitish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen somewhat sinuate, little oblique ; grey, irregularly mixed with white and strigulated with dark fuscous, sometimes partially suffused with brownish or light ochreous, especially tending to form a patch in disc beyond middle ; costa spotted and strigulated with blackish ; edge of basal patch irregularly marked with blackish, angulated below middle ; central fascia represented by a dark fuscous spot on costa and a trapezoidal blackish blotch before tornus : a very irregular-edged black streak extending from disc at ¾ to apex ; ocellus very obscurely edged with leaden-grey and whitish, and mixed with blackish: cilia grey irrorated with whitish, partially obscurely barred with dark fuscous. Hindwings with 3 and 4 connate : thinly scaled, semitransparent iridescent-grey ; veins and termen dark fuscous; cilia whitish-grey, with grey subbasal shade.

Khasis ; in June, September, and October, five specimens.

Eucosma numellata, n. sp.

♂ ♀. 11-13 mm. Head and thorax dark fuscous mixed with yellow-ochreous, face ochreous, lower part whitish. Palpi whitish-ochreous, spotted with dark fuscous suffusion. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique ; blackish-fuscous, irregularly strewn with pale ochreous scales and strigulæ ; two leaden-metallic striæ near base reaching from costa half across wing : two subconfluent pairs of leaden-metallic angulated striæ before middle, rising from pairs of white costal strigulæ ; a third similar beyond middle, but not reaching dorsum ; ocellus enclosed by two leaden-metallic streaks ; a very oblique leaden-metallic striga from a white strigula on costa at ⅗ to near termen beneath apex ; three pairs of white costal strigulæ posteriorly, last giving rise to a short leaden-metallic striga: cilia whitish-ochreous, with dark leaden-grey subbasal line, on tornus suffused with grey. Hindwings with 3 and 4 connate ; dark fuscous, lighter towards base ; cilia pale fuscous, with darker subbasal line.

Khasis ; in March and October, three specimens. Very like *speculatrix*, but termen of forewings less sinuate, and ♂ immediately distinguished by different colour of hindwings.

Eucosma lasiura, n. sp.

♂. 21-22 mm. Head and thorax dark fuscous. Palpi ascending, fuscous. Abdomen rather elongate, posterior half clothed with dense rough expansible lateral tufts of fuscous scales meeting above. Posterior tibiæ with rough projecting pale greyish-ochreous scales above and beneath. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex rounded-obtuse, termen rounded, little oblique ; fuscous, strigulated and marbled with dark fuscous ; costa spotted with dark fuscous, strigulated with fuscous-whitish between the spots ; a quadrate dark fuscous spot beneath middle of disc ; an ochreous-whitish discal dot at ⅗, preceded by a spot of dark fuscous suffusion ; cilia fuscous, with dark fuscous subbasal shade. Hindwings as broad as forewings, dorsal area folded over into a deep pocket and clothed with long rough hairs with a thickened glandular area, 3 and 4 connate ; fuscous ; cilia whitish-fuscous, with fuscous subbasal shade.

N. Coorg, 3,500 feet (Newcome); in August, two specimens. Very similar superficially to *helota*, but distinguished by the sexual characters, especially the absence of the costal fold, which in *helota* is long; a third very similar species is *brachyptycha* (described from Australia, but occurring also in Ceylon) which has a short costal fold.

Lobesia genialis, n. sp.

♂. 12 mm. Head whitish-ochreous, face suffused with white, crown with two blackish spots. Palpi pale ochreous irrorated with dark fuscous, terminal joint, apex of second, and base white. Thorax ochreous mixed with whitish and transversely barred with blackish. Abdomen elongate, ochreous, anal segment with two black basal dots. Posterior tibiæ and basal joint of tarsi clothed with rough whitish scales above. Forewings elongate, narrow at base, posteriorly somewhat dilated, costa almost straight, with elongate glandular swelling beyond middle, apex obtuse, termen rounded, rather strongly oblique; light brownish-ochreous mixed with leaden-grey and white, with fine scattered black scales; basal patch irregularly marked with deeper ochreous and black, outer edge very obtusely angulated in middle; space between this and central fascia suffused with grey on dorsal half; central fascia ochreous-brown, direct, posterior edge with strong acute-triangular projection in middle, marked with a curved black streak along costal half; a small blackish spot on posterior portion of costal gland; a triangular dorsal spot between central fascia and tornus irrorated with dark grey and blackish; four pairs of whitish strigulæ on posterior half of costa, last giving rise to a circularly curved white line which cuts off a brown apical spot centred with blackish; a brownish blotch before middle of tornus, above convex and limited by a white line running to termen above middle, beneath undefined: cilia light ochreous suffused with whitish except round apex. Hindwings with termen deeply excavated so as to form an elongate narrow apical lobe or projection and broader rounded dorsal lobe; white, apical lobe rather dark grey; cilia whitish, round apex grey.

Peradeniya, Ceylon (Green); in January, one specimen.

Polychrosis cellifera, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax pale ochreous mixed with brownish and dark fuscous. Posterior tibiæ in ♂ clothed with whitish hairs above, basal joint of tarsi with long projecting brush of whitish hairs. Forewings suboblong, rather narrowed anteriorly, costa gently arched, apex obtuse, termen rounded, little oblique; pale ochreous mixed with brownish-ochreous and grey; basal patch strigulated with blackish, outer edge only defined by a small dark spot on costa and a slight angulated mark in disc; central fascia irregular, brown, reaching from costa $\frac{2}{3}$ across wing, strongly marked with black from costa to near middle of wing; costa posteriorly dark fuscous with four pairs of grey-whitish strigulæ, beneath this narrowly reddish-brown; a narrow grey and brown subterminal fascia marked with black dashes on veins, constricted or almost interrupted in middle; a short brown or grey streak marked with black along median portion of termen: cilia brownish or fuscous irrorated with whitish, with two dark fuscous lines becoming obsolete towards tornus. Hindwings in ♂ with subdorsal fold; fuscous, lighter anteriorly; cilia whitish-fuscous, with darker subbasal line.

Colombo, Ceylon (Mackwood); Pusa (Fletcher); in July, two specimens.

Statherotis decorata, Meyr.

♀. 19 mm. Head and thorax brown mixed with dark fuscous, lower half of face whitish, thoracic crest mixed with whitish. Abdomen dark fuscous. Forewings brown sprinkled with dark fuscous; an undefined basal patch strigulated with black; a semioval reddish-brown blotch extending along costa from $\frac{1}{3}$ almost to apex, on costal edge shortly strigulated with black, on lower edge margined anteriorly by a thick curved black streak from costa to beyond its middle, and posteriorly by an irregular black streak running from apex towards tornus $\frac{3}{4}$ across wing and dilated into a blotch in its central portion, the opening between these two streaks somewhat whitish-mixed; a short blackish streak along median portion of termen: cilia brown mixed with dark fuscous. Hindwings dark grey, cilia grey, with dark grey subbasal line.

Madulsima, Ceylon, in March (Green). This sex, which differs considerably in colouring from the ♂, has not been described before.

Argyroploce lamyra, Meyr.

Kegalle, Ceylon (Alston); one specimen. Described from Queensland, and not hitherto recorded elsewhere.

Argyroploce compsitis, n. sp.

♀. 13 mm. Head grey. Palpi grey, with a blackish band. Thorax grey, crest blackish. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique; leaden-grey with faint purplish reflections; costa strigulated with black and whitish; two black dots near base, and one beneath costa at $\frac{1}{5}$; a triangular blackish white-edged blotch on dorsum at $\frac{1}{3}$, reaching more than half across wing; central fascia blackish on upper half, blackish-sprinkled but little marked on lower, white-edged on posterior margin, broadest in middle, beneath this suddenly narrowed and with a triangular slightly whitish-edged prominence downwards from anterior margin; an oblique transverse spot from costa at $\frac{2}{3}$, upper half blackish, lower half ferruginous-brown with two black bars; a blackish blotch before middle of termen, touching central fascia and termen, suffused beneath, convex and white-edged above; two small dark fuscous spots on costa posteriorly, terminated beneath with ferruginous-brown and a black dot; a small dark fuscous apical spot: cilia grey sprinkled with bluish-white, on upper half of termen obscurely barred with dark fuscous. Hindwings grey, thinly scaled anteriorly, broadly suffused with dark fuscous towards termen; cilia whitish-grey, with dark grey subbasal line.

Maskeliya, Ceylon (Alston); in November, one specimen.

Argyroploce scolopendrias, n. sp.

♂. 19 mm. Head, palpi, and thorax reddish-fuscous mixed with blackish. Posterior tibiæ without tufts. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen somewhat sinuate, rather oblique; crimson-fuscous, indistinctly striated longitudinally with blackish in disc, suffused with ochreous-whitish towards base in middle; costa strigulated with blackish and whitish; a slender black submedian streak from base to beyond middle, edged beneath with ochreous-brown suffusion; dorsal area beneath this forming a broad pale ochreous streak continued across tornus and as a broad terminal patch indistinctly lined with brownish to apex, where it is terminated by an oblique white mark; a white transverse linear mark on end of cell, and a black median streak from this to termen: cilia ochreous-whitish, with a reddish-fuscous bar at apex, and two on middle of termen. Hindwings with 3 and 4 stalked; light greyish-ochreous; cilia ochreous-whitish, with grey subbasal line.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen. Very similar to *scorpiastis*, but forewings more elongate, termen more oblique, dorsal pale area forming a uniform band with straight black upper edge, hindwing paler.

Argyroploce scorpiastis, n. sp.

♂ ♀. 16-18 mm. Head and thorax fuscous, often reddish-tinged, sometimes mixed with dark fuscous. Palpi reddish-whitish barred with blackish suffusion. Posterior tibiæ without tufts. Forewings elongate, moderate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, little oblique; crimson-fuscous, lighter and more crimson-tinged towards costa; costa obliquely strigulated with dark reddish-fuscous and sometimes with whitish; basal $\frac{2}{3}$ longitudinally striated with ochreous-whitish in disc, mixed with black between striæ; a white transverse linear mark on end of cell, space between this and termen streaked longitudinally with ochreous whitish or brownish-ochreous, with a black median streak; a pale ochreous semioval patch extending along dorsum from $\frac{1}{4}$ to $\frac{3}{4}$, brownish-edged towards upper edge posteriorly, edged with whitish above; tornal area suffused with whitish-ochreous; dorsum and termen dotted with blackish: cilia whitish-ochreous, with a dark fuscous bar at apex and two in middle of termen. Hindwings with 3 and 4 stalked; fuscous; cilia ochreous-whitish, with fuscous subbasal line.

Khasis; in October and November, four specimens.

Argyroploce antaea, n. sp.

♂ ♀. 15-17 mm. Head fuscous, crown suffused with blackish, lower part of face whitish. Palpi whitish, second joint with a more or less marked black bar. Thorax whitish fuscous, with suffused dark fuscous dorsal stripe, crest blackish. Posterior tibiæ in ♂ with long ochreous-whitish scales towards apex above. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, vertical; brownish-ochreous, somewhat blackish-sprinkled, veins towards termen marked with blackish lines; costa black with pairs of white strigulæ giving rise to very oblique whitish strigæ crossing subcostal area only a whitish streak along submedian fold from base to ⅗, and a patch of undefined whitish suffusion on tornus, tending to form streaks between veins; a streak of blackish suffusion along dorsum from base to middle: cilia whitish-ochreous, with fuscous bars at apex and in middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous-whitish, with fuscous subbasal line.

Kandy, Ceylon (Mackwood, Green); in February and from July to November, five specimens.

Argyroploce centritis, n. sp.

♂. 16 mm. Head and palpi reddish-fuscous. Thorax reddish-fuscous patagia paler, crest ferruginous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; brown; a black dot towards costa at ¼, and a few small scattered blackish dots in disc posteriorly; a streak of whitish irroration along dorsum from ¼ to tornus, anterior half of upper edge forming a triangular projection which reaches half across wing, and there is a second shorter projection beyond this, dorsal edge marked with a brown spot beneath first projection and a smaller one between the two: cilia brown, on tornus grey. Hindwings grey, thinly scaled, termen rather broadly suffused with dark fuscous; cilia whitish, with dark grey subbasal line.

Khasis; in November, one specimen. Allied to *caryactis*.

Argyroploce sandycota, n. sp.

♂. 12 mm. Head and thorax reddish-ochreous spotted with blackish. Palpi whitish-ochreous suffused with reddish-orange towards apex, with a blackish spot on base of second joint. Forewings elongate-triangular; costa gently arched, apex rounded-obtuse, termen rounded, little oblique; orange red, irregularly reticulated with dark fuscous; costa strigulated with black, interspaces posteriorly whitish; a blackish streak along dorsum from base to ⅖ and a blackish spot on costa at ¼; a larger irregular blackish spot on costa beyond middle, and the reticulation coalesces into irregular markings in disc posteriorly and before tornus. Hindwings dark grey, thinly scaled anteriorly; cilia grey, with darker subbasal line.

Hakgala, Ceylon (Green); in April, one specimen.

Argyroploce iophaea, n. sp.

♂♀. 13-15 mm. Head white, crown tinged with grey. Palpi white, second joint with two faint grey or brownish spots. Thorax crimson grey mixed with white, thoracic crest large, dark crimson-brown. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen sinuate, little oblique; crimson-brown or deep crimson, often partially strewn with suffused whitish strigulæ, and marked with suffused iridescent-violet striæ; base narrowly whitish; a flattened-triangular patch of blackish suffusion extending along costa from near base to near apex, and reaching in middle half across wing, marked with oblique bluish-leaden-metallic strigæ rising from pairs of whitish costal strigulæ; some blackish and leaden-metallic suffusion towards dorsum, especially on anterior half and on tornus; a more or less marked whitish-ochreous streak along termen; a fine black terminal line: cilia whitish-ochreous, sometimes suffused with crimson on outer half, sometimes with a dark leaden-fuscous patch beneath tornus. Hindwings fuscous; cilia pale fuscous, with darker subbasal line.

Maskeliya, Ceylon (Pole, Alston); in May, June and November, four specimens.

Argyroploce microplaca, n. sp.

♂♀. 8-9 mm. Head, palpi, and thorax dark fuscous. Forewings elongate, narrow, costa slightly arched, apex round-pointed, termen sinuate, hardly oblique; blackish-fuscous, crossed by suffused blue-leaden-metallic striæ rising from oblique white costal strigulæ; a pale yellow-ochreous transverse patch reaching from termen close before tornus $\frac{3}{4}$ across wing, and touching an oblique apical wedge-shaped strigula of same colour: cilia pale yellow-ochreous. Hindwings grey; cilia light grey.

Khasis; in October and November, three specimens.

Argyroploce anemodes, n. sp.

♀. 12-13 mm. Head fuscous. Palpi iridescent-white, second joint with two spots of dark grey suffusion. Thorax blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex, obtuse, termen almost straight, vertical; dark purple-fuscous suffused with blackish, finely sprinkled with minute ochreous points, a basal patch of leaden-metallic striation mixed with whitish, outer edge oblique and extended as a dorsal streak to ocellus; a blotch of leaden-grey markings mixed with white on costa before middle; three white costal strigulæ beyond this; two stronger white strigulæ enclosing apex; ocellus margined anteriorly by a double blue-leaden-metallic streak, and posteriorly by a blue-leaden-metallic whitish-edged spot cut by a blackish dash: cilia fuscous mixed with leaden-grey and dark fuscous, sometimes suffused with whitish-ochreous on tornus. Hindwings dark fuscous, more blackish posteriorly; cilia grey-whitish, with dark grey subbasal shade.

Kandy, Ceylon (Green); in June and August, two specimens.

Argyroploce pyrrhocrossa, n. sp.

♂ ♀. 15-16 mm. Head, palpi, and thorax light brownish finely sprinkled with fuscous or dark. Abdomen blackish-grey, in ♂ rather elongate. Forewings elongate, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen sinuate, vertical; brownish, finely irrorated with whitish and dark fuscous; costal edge blackish strigulated with whitish; some undefined darker median suffusion from base to middle; a similar patch on tornus; two short oblique-leaden-metallic strigæ from costa posteriorly: cilia brown-reddish, at apex dark fuscous. Hindwings dark fuscous, more blackish posteriorly; cilia whitish-grey, with dark fuscous subbasal line.

Khasis; in March and November, three specimens. Specially characterised by the contrasted reddish cilia of forewings.

Pammene homotorna, n. sp.

♂ ♀. 11-13 mm. Head, thorax, and abdomen dark fuscous. Palpi ascending, pale whitish-ochreous. Forewings elongate-triangular, costa gently arched, apex rounded-obtuse, termen slightly rounded, rather oblique; 7 to apex; dark purplish-fuscous, sprinkled with blue-whitish points, costa with pairs of fine whitish strigulæ; anterior half of wing mostly covered by suffused curved leaden-metallic striæ; a thick curved blue-leaden-metallic striæ from $\frac{3}{5}$ of costa to tornus, lower portion with two short projections anteriorly; a subterminal series of black dots or short dashes strongest towards apex of wing: cilia whitish-fuscous, with dark fuscous basal and subapical shades, latter obsolete towards tornus. Hindwings with 3 and 4 stalked; dark fuscous, suffused with blackish posteriorly; cilia as in forewings.

Khasis; in June and September, six specimens.

Pammene theristis, n. sp.

♂ ♀. 11-14 mm. Head, thorax and abdomen dark fuscous. Palpi ascending, ochreous-whitish, in ♂ sprinkled with grey, in ♀ irrorated with dark fuscous. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen hardly sinuate, little oblique; 7 to termen; dark purplish-fuscous, slightly sprinkled with purple-whitish points; costa shortly strigulated with blackish; two sharply-marked ochreous white wedge-shaped costal strigulæ before apex; a blackish stria from costa at $\frac{2}{3}$ to termen above middle, in ♂ preceded and followed by blue-leaden-metallic strigæ: cilia rather dark purplish-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked: dark fuscous, darker posteriorly; cilia fuscous-whitish, violet-iridescent, with dark fuscous basal line.

Maskeliya, Ceylon (Pole, de Mowbray); Kumaon; in May, June and October, four specimens. Bred from seedlings of *Shorea robusta* (Indian Forest Service).

Pammene peristictis, n. sp.

♂. 8-10 mm. Head, thorax and abdomen dark fuscous. Palpi rather long, porrected, pale ochreous-yellowish, with a dark violet-fuscous oblique apical bar. Forewings subtriangular, costa posteriorly moderately arched; apex very obtuse, termen somewhat sinuate beneath apex, vertical; 7 to termen; dark purplish-fuscous, slightly sprinkled with whitish points, with some irregular indistinct broken darker transverse striæ; a nearly straight blackish stria from costa beyond middle to termen beneath apex; several blackish dots close before termen between this and tornus: cilia purplish-leaden-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked; dark fuscous, basal half suffused with purple-blackish, termen somewhat paler-suffused; cilia fuscous. Undersurface of forewings with a blackish patch in middle of disc.

Maskeliya, Ceylon (Pole); in March, five specimens.

Laspeyresia prolopha, n. sp.

♂ ♀. 11-12 mm. Head and thorax grey with bluish iridescence, thorax obscurely barred transversely with darker. Palpi grey mixed with whitish, violet-iridescent. Abdomen dark fuscous, in ♂ ochreous-whitish beneath and on lateral patches before apex. Forewings suboblong, costa gently arched, bent in middle, with a projection of rough scales on bend, apex obtuse, termen slightly sinuate, vertical; dark purplish-fuscous, mostly overlaid with bluish-leaden-metallic suffusion, which covers most of basal and costal area anteriorly, a patch on middle of dorsum and two patches enclosing ocellus; two very oblique series of short black dashes crossing costal area posteriorly, with a blue leaden striga between them; some short whitish strigulæ on posterior half of costa, a pale ochreous dot in disc at $\frac{2}{3}$: cilia purplish-fuscous, with blackish subbasal line. Hindwings with 6 and 7 somewhat approximated towards base; dark fuscous, a suffused whitish-fuscous discal patch; cilia white, towards tornus violet-iridescent, with dark fuscous subbasal line. Undersurface of forewings with a whitish streak beneath cell; of hindwings with a whitish subdorsal streak, in ♂ surrounded with blackish suffusion, and a whitish patch in disc.

Khasis; in June and July, eight specimens.

Laspeyresia optica, n. sp.

♂. 16 mm. Head and thorax fuscous. Palpi fuscous suffusedly irrorated with whitish. Abdomen dark fuscous. Forewings elongate, moderate, posteriorly dilated, costa gently arched, apex obtuse, termen hardly sinuate, vertical; dark prismatic-fuscous, with strong green reflections, finely irrorated with pale ochreous-tinged points; costa very shortly and obscurely strigulated with blackish and whitish; three blue-metallic oblique strigæ from posterior half of costa, second short, beneath it an oblique series of two or three indistinct short blackish dashes; ocellus forming a bluish-leaden-metallic transverse patch, anterior angle touching first striga, its upper portion suffused with ground colour and finely striated longitudinally with blackish; a short distinct ochreous-white blue-tipped costal strigula before apex: cilia purplish fuscous, round apex and upper half of termen lighter and bluish metallic, with blackish basal line. Hindwings with 6 and 7 rather approximately towards base; blackish; a suffused irregular whitish median band, not reaching margins, cut by blackish streaks on veins; cilia white with violet-blue iridescence, with dark fuscous basal line, round apex grey. Undersurface of forewings with white streak along lower margin of cell.

Khasis; in June, one specimen.

Laspeyresia pulverula, n. sp.

♂. 14 mm. Head and thorax dark fuscous irrorated with pale greyish-ochreous, face whitish-ochreous. Palpi whitish. Abdomen dark fuscous. Forewings elongate-triangular, costa slightly arched, apex obtuse, termen slightly rounded, somewhat oblique; dark purple-fuscous, anterior $\frac{2}{3}$ closely irrorated with ochreous-whitish, leaving an oblique dark fuscous mark crossing submedian fold before middle; costal area suffused with brown on posterior half, edge strigulated with whitish; a short oblique blackish striga from middle of costa and another from beneath costa at $\frac{3}{4}$ to above middle of termen, each followed by a purple-leaden-metallic striga; ocellus margined by ochreous-whitish irroration and very obscure leaden-metallic streaks: cilia grey, with black basal line. Hindwings with 6 and 7 approximated towards base; dark fuscous, with broad blackish terminal band; a suffused whitish spot in middle of disc; cilia white, with blackish basal line. Undersurface of forewings with streak of whitish suffusion along lower margin of cell; of hindwings with larger whitish discal patch.

Khasis; in June, one specimen.

Laspeyresia leucostoma, n. sp.

♂ ♀. 11-15 mm. Head dark fuscous, face white. Palpi white. Thorax grey, with a more or less developed blackish bar behind collar. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; purplish-fuscous suffused with blackish, with irregular broken violet-leaden-metallic striæ rising from pairs of whitish costal strigulæ; ocellus enclosed by two violet-leaden-metallic streaks, anterior duplicated, posterior followed by an irregular whitish-ochreous termina streak; upper half of ocellus suffused with whitish-ochreous; an irregular patch of whitish-ochreous suffusion above ocellus; two larger yellowish-white strigulæ at apex: cilia leaden-grey with a dark fuscous basal line finely edged with ochreous-white, more broadly at apex. Hindwings dark fuscous, thinly scaled on basal half; cilia iridescent-whitish with dark fuscous basal line.

Maskeliya, Ceylon (Alston); Palnis (Campbell); Khasis; from May to October, eight specimens.

Laspeyresia turifera, n. sp.

♂. 13 mm. Head yellow, sidetufts of crown dark fuscous. Palpi yellow, base brownish. Thorax and abdomen dark fuscous. Forewings moderate, posteriorly dilated, costa slightly arched, apex obtuse, termen rounded, little oblique ; dark brownish, strigulated with dark fuscous : a broad bright yellow transverse band extending from near base to middle posterior edge straight, vertical, rather irregular, costal edge strigulated with dark fuscous : cilia brownish with two dark fuscous shades. Hindwings with 6 and 7 approximated towards base ; dark fuscous ; cilia grey with dark fuscous basal line.

Khasis ; in March, one specimen.

Laspeyresia primigena, n. sp.

♂. 11-13 mm. Head with appressed scales, blackish reticulated with whitish. Palpi transversely compressed, white, with black anterior streak. Thorax blackish transversely barred with whitish. Forewings rather elongate-triangular, costa gently arched, apex obtuse, termen rounded, somewhat oblique; bronzy-blackish; basal $\frac{2}{5}$ of wing sharply strigulated with whitish; a patch of about four incurved whitish striæ from middle of dorsum reaching $\frac{2}{3}$ across wing, apices tending to be broken up and connected into longitudinal striæ ; several ochreous-white strigulæ from costa posteriorly, whence proceed some faint oblique strigæ of whitish irroration, and two or three short oblique shining blue-metallic strigæ ; a shining blue-metallic dot in disc beyond middle ; ocellus marked with two transverse ochreous-whitish streaks and enclosed by shining blue-metallic streaks, interior broken into spots ; a short shining blue-metallic mark beneath apex : cilia rather dark purple-fuscous, with black basal line. Hindwings with 6 and 7 approximated towards base ; blackish-fuscous ; a thinly scaled fuscous-whitish elongate patch extending in disc from base to beyond middle ; cilia white, with blackish basal line.

Khasis ; in October and November, two specimens. The peculiar character of the palpi and head appears to show undoubted affinity to the *Glyphipterygidæ* marking this as an early type of the genus ; but the neuration is as in typical forms of *Laspeyresia*.

(*To be continued.*)

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES IV, PART III.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page 446 of this Volume.*)

Genus Monodes.

	Type.
Monodes, Guen. Noct., i., p. 240 (1852)	*nucicolora.*
Alpesa, Wlk., xv., 1662 (1856)	*villicosta.*

Proboscis fully developed; palpi upturned, rather slender, the 2nd joint reaching to vertex of head, the 3rd moderate; frons smooth; eyes large, round; antennæ of male typically ciliated; build slender; thorax chiefly clothed with scales, the pro and metathorax with typically slight spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with ochreous costal fascia and apical mark.
  a. Forewing with the reniform with white annulus defined by black .. .. *conjugata.*
  b. Forewing with the reniform almost obsolete .. *fissistigma.*
B. Forewing with the costal fascia grey, the apical mark ochreous .. .. *trifissa.*

2537. Monodes conjugata.

Hydrelia conjugata, Moore, P. Z. S. 1881, p. 369; Hmpsn., Cat. Lep. Phal. B. M., viii, p. 473, pl. 134, f. 9.

Eurois albicostata, Hmpsn., Moths Ind. ii, p. 228 (1894).

2049 *a*. Monodes fissistigma.

1777 *a*. Monodes trifissa.

Monodes trifissa, Hmpsn., Cat. Lep. Phal. B. M., viii, p. 475, pl. 134, f. 12, (1909).

♀. Head and thorax ochreous white tinged with rufous, the extremities of patagia with some black scales and the metathoracic crest blackish; pectus and legs suffused with fuscous brown; abdomen ochreous suffused with brown, the basal crest fuscous. Forewing with the base and costal area to just beyond postmedial line grey slightly irrorated with black, the inner area and a broad curved fascia from end of cell to apex ochreous, the cell and area beyond its lower extremity rufous and the medial part of terminal area grey with slight dark streaks on the veins and in interspaces; subbasal line represented by a slight oblique black striga from costa; antemedial line absent; orbicular white with an ochreous tinge in centre and slightly defined by brown at sides, narrow, very oblique, its lower extremity produced to three oblique white streaks with a bar across their extremities below the reniform which is represented by a very slight ochreous lunule; an oblique ochreous streak from below the orbicular to submedian fold at postmedial line, which is very indistinct and double from costa to vein 3, strongly bent outwards below costa, bent inwards at vein 3 and sinuous to inner margin; a terminal series of black points. Hindwing greyish wholly suffused with fuscous brown; the underside ochreous irrorated with fuscous, a blackish discoidal spot, curved waved postmedial line, and terminal series of striæ.

Habitat.—PUNJAB, Simla. *Exp.* 24 mill.

Genus NEOMILICHIA.

Type.

Neomilichia, Hmpsn., Cat. Lep. Phal. B. M., viii, p. 518 (1909) .. .. *hylea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd moderate; frons with slight rounded prominence with corneous plate below it; eyes large, round; antennæ of male ciliated; build slender; head and thorax clothed chiefly with scales, the pro and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2048. NEOMILICHIA VEPRECOLA.

Genus PERIGEODES.

Type.

Perigeodes, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 287 (1908). *rectivitta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately scaled in front, the 3rd rather long; frons smooth; eyes large, round; antennæ of male ciliated: head and thorax smoothly clothed with scales, the pro and metathorax with spreading crests, tibiæ moderately fringed with hair; abdomen with small dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate, the cilia strongly dentate especially towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with large white patch on inner medial area extending almost to cell .. .. .. *poliomera.*

B. Forewing without white patch on inner medial area extending almost to cell.

a. Forewing with the lower part of reniform very large and extending to well below cell .. .. *tricycla.*

b. Forewing with the lower part of reniform moderate and extending to slightly below cell.

a^1. Forewing with bifid black spot beyond lower part of reniform.

a^2. Forewing yellow, the antemedial line almost obsolete, the stigmata defined by black points. *magna.*

b^2. Forewing ochreous suffused with rufus, the antemedial line double, the stigmata with pale annuli .. .. *malayica.*

b^1. Forewing without bifid black spot beyond lower part of reniform .. .. *rectivitta.*

2051. *b*. PERIGEODES POLIOMERA.

Perigeodes poliomera, Hmpsn., Cat. Lep. Phal. B. M., vii., p. 287., pl. 115. f. 11 (1908).

Head, tegulæ and patagia ochreous tinged with rufous, the tegulæ with darker edges; palpi black above, white below; frons with black bar; vertex of thorax, pectus and legs white, the forelegs tinged with brown, the tarsi fuscous ringed with white; abdomen white tinged with brown, the basal crest black at tip. Forewing ochreous tinged with rufous, the area below costa paler, becoming pure white at apex. A large white patch on inner area from near base to near tornus, rounded above, the terminal area redder to the oblique streak from termen just below apex, suffused with black towards tornus; the base white; traces of a double waved subbasal line from costa to submedian fold; a very indistinct double waved antimedial line, obsolete on the white area; orbicular and reniform with whitish annuli slightly defined by brown, the former with brown centre round the latter with its centre defined by black points, constricted at middle; a blackish patch beyond lower angle of cell; postmedial line double almost obsolete towards costa, strongly bent outwards below costa, then oblique, minutely waved and with series of black and white points on its outer edge, bent outwards to inner margin at the extremity of the white patch, some slight pale points beyond it on costa; traces of a waved subterminal line; a terminal series of black points with white point before the point in submedian interspace; cilia reddish with series of black points at tips, wholly black towards tornus. Hindwing pale brown with terminal series of small dark lunules: cilia brownish white, the underside whitish, the costal area tinged with rufous, an indistinct diffused dark subterminal band from costa to vein 2, a terminal series of black points.

Habitat.—CENTRAL CHINA; HAINAN; ASSAM, Khasis. *Exp.* ♂ 32, ♀ 36 mill.

2051. a. PERIGEODES TRICYCLA.

Perigea tricycla, Guen., Noct 1. p. 226 (1852); Hmpsn. Cat. Lep.. Phal. B. M. vii, p. 289, pl. 115, f. 12.

Bagada fuscostrigata, Beth. Baker, Nov. Zool. xiii, p. 209 (1906).

♂. Head and thorax pale ochreous mixed with dark brown and tinged with rufous; palpi with some dark brown at side of 2nd joint; antennæ brown; abdomen pale ochreous tinged with rufous, dorsally dark brown except at base. Forewing pale ochreous suffused with rufous and slightly irrorated with dark brown, the inner margin with fuscous brown fascia tinged with grey except at base, the postmedial area greyish brown except towards costa, terminated by the oblique dark brown streak from apex to the postmedial line at vein 5, diffused below; subbasal line represented by two black points below the cell: antemedial line very indistinct, double, rufous, minutely dentate, below vein 1 strongly bent inwards to inner margin; claviform represented by a dark striga at its extremity; orbicular pale, defined by brown except above, irregularly rounded; reniform pale, slightly defined by brown, strongly constricted at middle and figure-of-eight-shaped, extending well below the cell to vein 2, some dark points in its lower part, traces of an oblique line from it to inner margin; postmedial line indistinct, double, strongly bent outwards below costa, then minutely waved and oblique, some pale points beyond it on costa; subterminal line very indistinct, pale, defined on inner side by brown suffusion, slightly excurved below vein 7 at middle; a terminal series of dark points defined on inner side by pale lunules; cilia dark brown with a pale line at base. Hindwing dark brown with a reddish tinge; cilia with a pale line at base; the underside whitish tinged with brown, the terminal area suffused with brown, a brown postmedial line from costa to vein 5.

ab. 1, *fuscostrigata*—Hindwing on underside much more suffused with brown, a dark discoidal spot, the postmedial line entire.

Habitat—ASSAM, Khasis; BORNEO; BR. NEW GUINEA. *Exp.* 42-44 mill.

2051. PERIGEODES MAGNA.

2052. PERIGEODES MALAYICA.

Orthogonia malayica, Snell., Veth's Midden Sumatra Lep., p.. 46, pl. 4, f. 6 (1892).

Xanthoptera nigridia, Hmpsn. Moths Ind., ii, p. 320 (1894).

2428. PERIGEODES RECTIVITTA.

Genus PERIGEA.

	Type.
Perigea, Guen. Noct., i., p. 225 (1852)	*spicea.*
Condica, Wlk., ix., 239 (1856)	*cupentia.*
Prospalta, Wlk., xiii., 1114 (1857)	*leucospila.*
Bagada, Wlk., xv., 1753 (1858)	*spicea.*
Gaphara, Wlk., Trans. Ent. Soc. (3) i., p. 96 (1862)	*tetera*
Myrtale, Druce, Biol. Centr. Am. Het. i., p. 443 (1891)	*imitata.*

Proboscis fully developed; palpi upturned, the 2nd joint typically reaching about to vertex of head and smoothly scaled, the 3rd typically rather long; frons smooth; eyes large, round; antennæ of male typically minutely ciliated; thorax smoothly clothed with scales, the prothorax with spreading crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with slight dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with a large part of wing occupied by grey or white patches .. .. *leprosa.*

B. Forewing with a large part of wing not occupied by grey or white patches.

- *a.* Forewing cupreous black brown.
    - a^1. Forewing with subterminal and terminal series of small white spots.
        - a^2. Forewing with the orbicular white centre defined by white points .. .. .. *stellata.*
        - b^2. Forewing with the orbicular not defined by white points.
            - a^3. Forewing with the centre of the reniform broken up into white points .. .. *contigua.*
            - b^3. Forewing with round white spot in centre of reniform with small brown lunule on it .. *leucospila.*
    - b^1. Forewing without terminal series of small white spots.
        - a^2. Forewing with the reniform broken up into white points .. .. *albomaculata.*
        - b^2. Forewing with the reniform with slight white lunule on its inner edge .. .. .. *atricuprea.*
- *b.* Forewing not cupreous black brown.

a^1. Forewing not yellowish with patches of rufous and brown suffusion in parts.
  a^2. Forewing with the reniform defined on all sides by white points.
    a^3. Hindwing white, the terminal area with dark suffusion, in female more suffused .. *dolerosa.*
    b^3. Hindwing entirely suffused with brown in both sexes .. .. *galaxia.*
  $b2$. Forewing with the reniform not defined on all sides by white points .. .. .. *capensis.*
$b1$. Forewing with the ground colour yellowish with patches of rufous and dark brown suffusion .. *spicea.*

2439*a*. PERIGEA LEPROSA.

1722*a*. PERIGEA STELLATA.

Prospalta stellata, Moore, Lep. Atk., p. 111 (1882); Hmpsn., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 27.

Head rufous, the basal joint of antennæ with white point in front; thorax deep red brown, the base of tegulæ rufous, the vertex of thorax and tip of prothoracic crest white; tarsi with white points; abdomen brown, the basal crest white, the others black, the ventral surface rufous. Forewing cupreous brown suffused with black leaving the discal and submedian folds redder; five white points at base in and below cell, followed by an oblique white striga from costa with two white points below it; an antemedial series of white points on and below costa and on the veins, defined by black and with white streak before it on inner margin; orbicular represented by a small white spot surrounded by white points; reniform with four white points in centre surrounded by white points; traces of a waved dark medial line; postmedial line indistinct, dark, with white point at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, oblique below vein 4, some white points beyond it on costa; a subterminal series of small white spots on the veins, reduced to points on veins 4·3·2; another series of small white spots just before termen and a series of points on termen; cilia with series of white spots at tips and points at middle towards apex. Hindwing fuscous brown, the cilia white at tips; the underside pale red-brown, the terminal area suffused with fuscous, a faint discoidal lunule and diffused minutely crenulate postmedial line.

Habitat.—SIKHIM. *Exp.* 40 mill.

1722*b*. PERIGEA CONTIGUA.

Prospalta contigua, Leech, Trans. Ent. Soc. 1900, p. 122; Hmpsn., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 28.

Head and thorax deep red-brown; basal joint of antennæ white; prothoracic crest with some white scales, the metathorax with white patch; tibiæ at base with white points, the tarsi ringed with white; abdomen brown with the basal crest white. Forewing black-brown with a cupreous gloss; two white points at base; a subbasal white striga from costa and spot below cell with point in cell further from base; antemedial line represented by a white striga from costa, points on the veins and point on inner margin further from the base; claviform a small white spot; orbicular a small round white spot defined by black; reniform with three white marks in centre surrounded by small spots; traces of a waved dark medial line; postmedial line indistinct, dark, with white points at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, excurved to vein 4, then oblique, some white points beyond it on costa; a subterminal series of small white spots on the veins, somewhat excurved below costa and at middle; a terminal series of white points. Hindwing fuscous brown, the cilia whitish, brown at tips; the underside fuscous irrorated with white; a dark discoidal lunule and diffused minutely waved postmedial line.

Habitat.—W. CHINA; ASSAM, KHASIS. *Exp.* 30—42 mill.

1723. PERIGEA LEUCOSPILA.

1722. PERIGEA ALBOMACULATA.

Mamestra albomaculata, Moore, P. Z. S. 1867, p. 52; Hmpsn. Cat. Lep. Phal. B. M. vii., p. 316, pl. 115, f. 31.

1722*c*. PERIGEA ATRICUPREA.

Perigea atricuprea, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 316, pl. 115, f. 32 (1908).

Head and thorax black-brown with a few white scales; metathorax with white patch; tarsi slightly ringed with white; abdomen fuscous brown. Forewing glossy black-brown slightly irrorated with white; an indistinct waved whitish subbasal line from costa to submedian fold, with white point beyond it in cell; antemedial line black defined on inner side by whitish, somewhat waved and oblique; orbicular and reniform defined by black, the former round, the latter with white lunule on its outer edges and somewhat angled inwards on median nervure; faint traces of an oblique medial shade from lower angle of cell to inner margin; postmedial line black with white striga from costa, strongly bent outwards below costa, then dentate and produced to short streaks on the veins, incurved below vein 4, some white points beyond it on costa; traces of a waved dark subterminal line with waved white striga from costa, incurved below vein 3; a terminal series of white points; cilia with a slight waved white line through them. Hindwing greyish suffused with fuscous brown, a faint discoidal spot and sinuous postmedial line; a fine black terminal and some whitish on termen towards tornus; cilia with a slight whitish line through them; the underside fuscous brown irrorated with white, a brown discoidal lunule and diffused curved postmedial line.

Habitat.—SIKHIM TIBET, Yatung. *Exp.* ♂ 34, ♀ 38 mill.

1721*a*. PERIGEA DOLEROSA.

Mamestra dolerosa, Wlk. XXXII. 667 (1865).
Hadena taprobanæ, Feld. Reis. Nov. pl. 110, f. 3 (1874).
Euplexia albomaculata, Semp. Schmett. Phil. p. 515, pl. 60. f. 2 (nec. Moore).

Head and thorax fuscous mixed with some ochreous; palpi black; the 2nd and 3rd joints white at tips; frons with black bars; tegulæ with black annuli; prothoracic crest tipped with ochreous, the metathorax with ochreous patch; pectus and legs ochreous white irrorated with brown; the tarsi black with pale tinge; abdomen ochreous suffused with fuscous brown. Forewing fuscous; subbasal line represented by ochreous striæ from costa and cell; some ochreous and black scales on inner margin before the antemedial line, which is indistinct, waved, black, interrupted, defined on inner side by ochreous striæ at costa and inner margin and ochreous point at submedian fold; orbicular with incomplete whitish annulus defined by black, small, irregularly elliptical; reniform with irregular white lunule in centre surrounded by ochreous points defined by black, constricted at middle; postmedial line with white spot at costa, strongly bent outwards below costa, then defined by slight ochreous lunules on outer side, dentate and produced to black and white points on the veins, oblique below vein 4, some white points beyond it on costa; subterminal line represented by a series of ochreous white points defined on inner side by small dentate black marks, excurved below vein 7 and at middle; a series of minute white points just before termen; cilia fuscous with series of ochreous white points at base. Hindwing white tinged with brown, the veins and terminal area suffused with fuscous brown, a terminal series of black striæ defined by whitish on inner side; cilia ochreous white, with a slight brown line through them on apical half; the underside white, the costal area tinged with ochreous and irrorated with fuscous, a discoidal point, slight diffused waved postmedial line from costa to vein 2, and diffused subterminal band.

Habitat.—C. CHINA; BOMBAY; MADRAS, Nilgiris; CEYLON, Kandy; PHILIPPINES, Manila; FIJI. *Exp.* 36-40 mill.

Larva, Brown. Food plant, *Conyza balsamifera*.

1721*b*. PERIGEA GALAXIA.

Perigea galaxia, Butl., P. Z. S. 1883, p. 159; Hmpsn. Cat. Lep. Phal. B. M. vii, p. 324, pl. 116, f. 9.

Head and thorax fuscous brown mixed with grey-white; tarsi black ringed with white; abdomen grey suffused with fuscous. Forewing grey suffused with fuscous and irrorated with white; subbasal line represented by a white striga from costa; antemedial line black, defined on inner side by white towards costa, waved, somewhat oblique; orbicular white defined by black, small, round; reniform a white lunule with some black points on it, its upper and lower extremities surrounded by white points; a diffused medial line, excurved at middle; postmedial line black, with white bar at costa, bent outwards below costa, then dentate and produced to black and white points on the veins, incurved below vein 4, some white points beyond it on costa; subterminal line defined by diffused fuscous on inner side, angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia with a series of white points at base. Hindwing grey-brown with a fuscous tinge; cilia whitish at tips; the underside white irrorated with fuscous, a discoidal lunule filled in with white, bisinuate postmedial line, and traces of diffused subterminal band.

Habitat.—PUNJAB, Kulu, Sultanpur, Simla, Dharmsala. *Exp.* 30-38 mill.

1721. PERIGEA CAPENSIS.

Apamea capensis, Guen. Noct. 1, p. 213 (1852); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 332, pl. 116, f. 20.
Perigea apameoides, Guen. Noct. 1, p. 229 (part).
Caradrina conducta, Wlk., X, 296 (1856).
Celæna serva, Wlk. XV., 1689 (1858).
Hadena pauperata, Wlk., XV, 1727 (1858).
Mamestra prodita, Wlk., Journ. Linn. Soc. Zool. vi, p. 185 (1862).
Perigea inexacta, Wlk., XXXII, 682 (1865).
" *canorufa*, Wlk., XXXII, 683 (1865).
" *illecta*, Wlk., XXXII, 684 (1865).
Hadena leonina, Wlk., XXXIII, 735 (1865).
" *spargens*, Wlk., XXXIII, 739 (1865).
" *funesta*, Wlk., XXXIII, 740 (1865).
Perigea centralis, Moore, Lep. Ceyl. iii, p. 28, pl. 147 f. 2 (nec. Wlk.).
" *meleagris*, Saalm. Lep. Madag., p. 271, f. 228 (1891).

2050. PERIGEA SPICEA.

Perigea spicea, Guen. Noct. 1, p. 226 (1852); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 348.
Bagada pyrochroma, Wlk., xv. 1753 (1858), Hmpsn. Ill. Het. B.M. ix, p. 97, pl. 162, f. 2.
Acontia firina, Swinh., P. Z. S. 1885, p. 455, pl. 27 f. 5.

Genus HADJINA.

	Type.
Hadjina, Staud., Iris., iv, p. 286 (1891)	*lutosa.*

Proboscis fully developed; palpi upturned, the 2nd joint slender, reaching to vertex of head and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; build slender; head and thorax clothed almost entirely with scales, the pro and meta-thorax with spreading crests; legs moderately fringed with hair ; abdomen with dorsal crest at base only. Forewing rather short and broad, the apex rounded, the termen evenly curved and slightly crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from well below middle of discocellulars ; 6·7 from upper angle ; 8 anastomosing with the cell near base only.

A. Forewing with the medial line indistinct or absent.

a. Forewing not suffused with fiery red.

a^1. Hindwing wholly tinged with brown.

a^2. Hindwing not ochreous.

a^3. Forewing with the inner area cupreous red .. *cupreipennis*.

b^3. Forewing with the inner area not cupreous red.

a^4. Forewing purplish red-brown .. .. *chinensis*.

b^4. Forewing fuscous brown .. .. *cinerea*.

b^2. Hindwing ochreous tinged with brown .. *modestissima*.

b^1. Hindwing white, the terminal area suffused with brown.

a^2. Forewing with the subterminal line excurved at middle .. .. *viscosa*.

b^2. Forewing with the subterminal line not excurved at middle .. .. *poliastis*.

b. Forewing suffused with fiery red .. .. .. *pyroxantha*.

B. Forewing with prominent rather diffused dark medial line .. .. *grisea*.

1834 *b*. HADJINA CUPREIPENNIS.

Hattia cupreipennis, Moore, Lep. Atk. p. 112 (1882) ; Hmpsn. Cat. Lep. Phal. B. M. viii, p. 525, pl. 136, f. 13.

Head and thorax fiery red mixed with dark brown and some grey ; abdomen dark brown. Forewing deep cupreous red shading to brown mixed with grey on costal and terminal areas ; subbasal line represented by a slight dark striga from costa ; antemedial line very indistinct, waved ; claviform absent ; orbicular and reniform whitish irrorated with brown and very faintly defined by brown, the former round, the latter somewhat quadrate ; postmedial line very indistinct, dark, bent outwards below costa, then produced to dark streaks with grey points on them on the veins, incurved below vein 4 ; hardly a trace of the subterminal line ; a fine punctiform black terminal line. Hindwing glossy yellowish brown ; a fine dark terminal line and slight pale line at base of cilia ; the underside pale tinged with red and thickly irrorated with brown, a small black discoidal lunule and traces of a curved postmedial line.

Habitat.—PUNJAB, Murree ; SIKHIM. *Exp*. 30-36 mill.

1833 *b*. HADJINA CHINENSIS.

Perigea chinensis, Wllgrn. Wien. Ent. Mon, iv, p. 169 (1860).

Segetia mandarina, Staud. Rom. Mem. vi, p. 482, pl. ix, f. 4 (1892); id. Cat. Lep. pal. p. 170.

,, *sareptæ*, Græs.Bul. Ent. Zeit. XXXII,p. 350(1888)nec.Guen.

Amyna pulverea, Leech, Trans. Ent. Soc. 1900, p. 114.

1834*c*. HADJINA CINEREA.

Hadjina cinerea, Hmpsn., Cat. Lep. Phal. B. M. viii., p. 526, pl. 136, f. 15 (1909).

♂. Head and tegulæ pale fulvous; thorax dark brown mixed with grey and a few black scales; tarsi with pale rings; abdomen grey-brown, the anal tuft ochreous. Forewing dark brown suffused with grey and irrorated with black; subbasal line represented by a slight grey striga from costa; antemedial line very ill-defined, grey, diffused, waved; claviform absent; orbicular and reniform grey irrorated with black, undefined, the former round, the latter somewhat constricted at middle; postmedial line very ill-defined, grey, diffused, bent outwards below costa and oblique below vein 4; subterminal line very indistinct, grey faintly defined by blackish on inner side, excurved below vein 7 and at middle; a terminal series of slight black points. Hindwing silky fuscous grey, the cilia slightly paler; the underside with faint black discoidal spot and traces of postmedial line.

Habitat—SIKHIM, 1,800′. *Exp.* 26 mill.

1880. HADJINA MODESTISIMA.

Apamea modestissima, Snell., Tijd. V. Ent. xx, p. 26, pl. 2, f. 14 (1877).

Hipœpa opacaria, Swinh., Trans. Ent. Soc., 1890, p. 264, pl. 8, f. 3.

1834*d*. HADJINA VISCOSA.

Mythimna viscosa, Frr. Neue. Beitr. i., p. 39, pl. 21, f. 3, (Aug. 1831) Staud. Cat. Lep. pal., p. 170.

,, *implexa*, Treit. Schmett. Eur. x., 2, p. 73 (1835); nec. Hübn. Dup. Lep. Fr. Suppl. iv., p. 98, pl. 58, f. 7.

Head and thorax red-brown mixed with grey scales; tarsi fuscous with pale rings; abdomen ochreous. Forewing red-brown slightly irrorated with greyish ochreous; subbasal line absent; antemedial line hardly traceable, greyish, waved; claviform absent; orbicular and reniform small with faint grey annuli, undefined, the former oblique elliptical, the latter constricted at middle; postmedial line very indistinct, slightly defined by grey on outer side and with prominent grey striga from costa, bent outwards below costa and oblique below vein 4, some pale points beyond it on costa; subterminal line very indistinct, pale, angled outwards at vein 7 and slightly excurved at middle; a terminal series of blackish points; cilia with a fine pale line at base. Hindwing white, the termen tinged with pale red-brown from apex to submedian fold, in female almost entirely suffused with brown; the underside with the costal area irrorated with red.

ab. 1.—Much more ochreous or grey irrorated with fuscous and with hardly a trace of rufous; forewing with the ante and post-medial lines more distinct, the former angled outwards in submedian fold and above inner margin and inwards on vein 1, a dark patch sometimes present between orbicular and reniform.

Habitat.—SPAIN; SICILY; CANARIES; SYRIA; PERSIAN GULF; SIND, Karachi 82. *Exp.* 28·34 mill.

1833*c*. HADJINA POLIASTIS.

1795*a*. HADJINA PYROXANTHA.

2053. HADJINA GRISEA.

Genus CATAMECIA.

Type.

Catamecia, Staud. Iris. x., p. 288 (1897) .. .. .. *jordana.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about middle of frons and moderately scaled, the 3rd short; frons with truncate conical prominence with slight raised edges and corneous plate below it; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ slightly fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male serrate.

1871. CATAMECIA FURTIVA.

Sect. II.—Antennæ of male ciliated.

1830. CATAMECIA MINIMA.

Apamea minima, Swinh., P. Z. S., 1889, p. 410; Hmpsn., Cat. Lep. Phal. B. M., viii. p. 543, pl. 136, f. 29.

Catamecia bacheri, Staud. Cat. Lep. pal., p. 213 (1901).

Genus NAMANGANA.

Type.

Namangana, Staud. Stett., Ent. Zeit. 1888, p. 28 .. *cretacea.*

Eupolia, Smith, Trans. Am. Ent. Soc., xxi., p. 69 (1894). . *licentiosa.*

Proboscis fully developed, palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled in front, the 3rd typically short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I. (*Eupolia*).—Antennæ of male bipectinate with long branches.

2054*a*. NAMANGANA PECTINICORNIS,

Sect. II. (*Namangana*).—Antennæ of male ciliated.

A. Forewing with elongate V-shaped black marks on terminal area between veins 7 and 3 .. .. *cashmirensis.*

B. Forewing without V-shaped black marked on terminal area .. .. *atrescens.*

1942. NAMANGANA CASHMIRENSIS.

1858*a*. NAMANGANA ATRESCENS.

Genus CINGALESA.

Type.

Cingalesa, Hmpsn., Moths Ind., ii., p. 336 (1894) .. *strigicosta.*

2108. CINGALESA STRIGICOSTA.

Genus LOPHOTYNA.

Type.

Lophotyna, Hmpsn., Cat. Lep. Phal. B. M., ix. p. 19 (1910). *albirena.*

Proboscis fully developed; palpi oblique, fringed with long hair in front, the 3rd joint short, porrect; frons smooth with large tuft of hair; vertex of head crested; eyes large, round; antennæ of male ciliated; head and thorax clothed almost entirely with scales, the tegulæ produced to a slight dorsal ridge, the pro-thorax with high triangular crest, the meta-thorax with spreading crest: tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex produced and acute, the termen strongly crenulate and obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen waved; veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1724. LOPHOTYNA ALBIRENA.

Genus GORTYNA.

Type.

Gortyna, Treit. Schmett. Eur. v (2) p. 330 (1825) .. .. *leucostigma.*

Helotropha, Led. Noct. Eur. p. 118 (1857) .. .. *leucostigma.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell: 5 obsolescent from middle of discocellulars: 6·9 from upper angle: 8 anastomosing with the cell near base only.

1795. GORTYNA LEUCOSTIGMA.

Noctua leucostigma, Hübn., Eur. Schmett. Noct. f. 375 (1808): Staud. Cat. Lep. pal, p. 186.
Noctua fibrosa, Hübn., Eur. Schmett. Noct. f. 385 (1808) Dup. Lep. Fr. vii 1, p. 132, pl. 109 f. 4; Steph. Ill. Brit. Ent. Haust. iii, p. 7.
,, *lunina*, Haw., Lep. Brit. p. 209 (1809).
Cerastis lævis. Butl., Trans. Ent. Soc. 1881, p. 181.
Hydræcia khasiana, Moore, P. Z. S., 1881, p. 342, pl. 37, f. 5.

Genus HYDRÆCIA.

	Type.
Gortyna, Ochs. Schmett. Eur. iv., p. 82 (1816) non descr.: Hübn. Verz., p. 232 (1827), nec. Treit. 1825 ..	*micacea.*
Hydræcia, Dup. Cat. Meth., p. 114 (1844)	*micacea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically minutely serrate; thorax clothed with hair and hair-like scales, the tegulæ produced to a slight dorsal ridge, the prothorax with sharp triangular crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with some rough hair at base, dorsal crest on first segment and lateral fringes of hair. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1594. HYDRÆCIA BASALIPUNCTATA.

Genus PYRRHIA.

	Type.
Pyrrhia, Hübn. Verz., p. 233 (1827)	*purpurina.*

1598. PYRRHIA UMBRA.

Noctua umbra, Hüfn. Berl. Mag. iii., p. 294 (1767); Smith, Cat. Noct. N. Am., p. 216; Staud. Cat. Lep. pal. p. 224.
,, *marginata*, Fabr. Syst. Ent., p. 610 (1775); Dup. Lep. Fr. vii. pl. 119, f. 8; Steph. Ill. Brit. Ent. Haust. iii., p. 108.

Noctua rutilago, Schiff, Wien. Verz. p. 88 (1776); Hübn. Eur. Schmett, Noct. f. 185.
,, *umbrago*, Esp. Schmett, iv., pl. 185, ff. 6-7 (1796).
,, *conspicua*, Borkh. Eur. Schmett, iv., p. 50 (1792).
,, *marginago*, Haw. Lep. Brit., p. 217 (1809).
Heliothis cilisca, Guen, Noct. ii., p. 179 (1852).
,, *exprimens*, Wlk. xi., 687 (1857); Grote, Bull. Buff. Soc. Nat. Sci. ii., p. 35, pl. iii., f. 5.
Pyrrhia angulata, Grote, Trans. Am. Ent. Soc. v., p. 93 (1874); id. Bull. Buff. Soc. Nat. Sci. ii., pl. 3, f. 6.
Hydrœcia tibetana, Moore, A. M. N. H. ( ) p. 232 (1878); id. 2nd Yarkand Mission Lep., p. 9, pl. i., f. 21.
Chariclea rexilliger, Christ, Iris., vi., p. 92 (1893); Staud. Cat. Lep. pal., p. 223.
Pyrrhia aconiti, Holtz., Allg. Zeitschr. Ent. vii., p. 212 (1902).

Genus CALLŒCIA. *Type.*

Callœcia, Hmpsn., Cat. Lep. Phal. B. M. ix., p. 56 (1910) .. *svinhœi.*

Proboscis fully developed: palpi obliquely upturned, the 2nd joint reaching to about middle of frons and moderately fringed with hair, the 3rd short; frons with large corneous prominence with raised edges, the lower edge produced to a plate grooved in front, a corneous plate below it; eyes large, round; antennæ of male laminate and almost simple; thorax clothed with hair and scales mixed, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair: abdomen without crests. Forewing with the apex rounded, the termen evenly curved and slightly crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell: 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2025. CALLŒCIA SVINHŒI.

Genus CYTOCANIS. *Type.*

Cytocanis, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 110 (1910). *denticulosa.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd moderate; frons with large corneous prominence with raised edges, its lower edge produced to a beak-like process; eyes large, round; antennæ of male laminate and almost simple; thorax clothed almost entirely with scales and without crests: tibiæ smoothly scaled, the joints of fore tarsi rather short and the fungues rather large; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2016. CYTOCANIS DENTICULOSA.

Genus ELYDNA.	Type.
Elydna, Wlk. xv., 1712 (1858)	*transversa.*
Dyrzela, Wlk., xv., 1758 (1858)	*plagiata.*
Dadica, Moore, P. Z. S. 1881, p. 349	*lineosa.*
Radinacra, Butl., A. M. N. H. (5) i., p. 161 (1878) ..	*cinerascens.*
Leucocosmia, Butl., Trans. Ent. Soc., 1886, p. 394 ..	*reclusa.*
Floccifera, Hmpsn., Moths. Ind. ii., p. 281 (1894) ..	*erigida.*

Sect I.—Antennæ of male bipectinate with long branches to just beyond middle, the apical part ciliated.

1885. ELYDNA BOSCA.

Sect II.—(*Dyrzela*).—Antennæ of male strongly serrate above to middle, strongly fasciculate below.

1886. ELYDNA PLAGIATA.

Sect III.—Antennæ of male ciliated.

A. (*Leucocosmia*). Vertex of head of male with a cleft corneous ridge clothed with scales; abdomen clothed with woolly pile; fore and hindwings clothed with woolly hair above.

1875. ELYDNA RECLUSA.

Prodenia reclusa, Wlk., Journ. Linn. Soc. Zool. vi, p. 185 (1862).
Amphipyra agrotoides, Snell, Tijd. v., Ent. 1880, p. 77, pl. 6, f. 6.
Radinacra thoracica, Moore, Lep. Ceyl. iii, p. 31, pl. 148, f. 4, (1884).
Leucocosmia ceres, Butl. Trans. Ent. Soc., 1886, p. 394, pl. 9, f. 10.
Caradrina euthusa, Hmpsn., Ill. Het. B. M. viii, p. 79, pl. 145, f. 1 (1891).
„ *heliarcha*, Meyr., Trans. Ent. Soc., 1897, p. 370.
„ *unipunctata*, Beth. Baker, Nov. Zool. xiii., p. 201 (1906).
„ *insignifica*, Beth. Baker, Nov. Zool. xiii, p. 201 (1906).

B. Vertex of head of male normal.

a. (*Floccifera*). Abdomen of male with large sublateral tufts of flocculent hair from base.

1938. ELYDNA ERIGIDA.

Aletia erigida, Swinh. Trans. Ent. Soc., 1890, p. 221.
Caradrina crenulata, Beth. Baker, Nov. Zool. xiii, p. 202 (1906).

b. Abdomen of male without sublateral tufts of long hair from base.

*a*¹. Hindwing of male with the costal area on underside clothed with rough downturned scales with thicker ridge of scales along subcostal nervure.

a^2. Hindwing of male on underside with ridge of scales on medial part of vein 1, covered by a thick fringe of hair from inner margin.

1874a. ELYDNA BIPUNCTA.

Cosmia bipuncta, Snell. Veth's. Midden. Sumatra Lep. 44, 1880.

Graphiphora stellata, Moore, Lep. Atk. p. 119 (1882).

Caradrina lophophora, Hmpsn., Trans. Ent. Soc., 1895, p. 299 : id. Moths, Ind. iv., p. 512.

Caradrina pratti. Beth. Baker, Nov. Zool. xiii., p. 202 (1906).

b^2. (*Dadica*). Hindwing of male with the inner area normal.

1877. ELYDNA LINEOSA.

b^1. Fore and hindwings of male with the medial part of termen excised.

1877a. ELYDNA TRUNCIPENNIS.

Elydna truncipennis, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 168, (1910).

Head and thorax whitish suffused with pale rufous, the head rather whiter; palpi black, whitish at tips and in front; tarsi blackish ringed with white; abdomen greyish suffused with fuscous brown. Forewing pale rufous with slight dark irroration, the terminal area rather darker; subbasal line blackish, straight from costa to submedian fold in which there is a black point beyond it and a white point in cell further from base, antemedial line blackish, erect, slightly bent inwards to costa and incurved below submedian fold; orbicular represented by a black point, the reniform by a small yellowish white spot usually with white point above it and two minute points below it; a diffused dark medial line, oblique from costa to median nervure, then incurved; postmedial line blackish, slightly bent inwards to costa and incurved below vein 3, with minute black streaks beyond it on the veins; subterminal line indistinct, brown, slightly incurved between veins 6 and 4; a fine dark terminal line; cilia fuscous brown with a fine whitish line at base. Hindwing whitish suffused with brown especially on the veins and terminal area; cilia whitish with a brownish line near base from apex to vein 2; the underside with the costal area irrorated with brown, a small discoidal spot, postmedial series of slight black streaks on the veins and traces of a postmedial line towards costa.

Habitat.—JAPAN; COREA; N. CHINA; W. CHINA; PUNJAB, Kulu, Sultanpur; SIKKIM; ASSAM, Khasis; CEYLON, Pundaluoya, *Exp.* 28-34 mill.

c^1. (*Elydna*) Wing of male normal.

a^2. Forewing grey brown.

a^3. Forewing with the postmedial line minutely dentate .. .. *ochreipuncta.*

b^3. Forewing with the postmedial line not dentate.

a^4. Forewing with series of black points on the veins beyond postmedial line .. .. *renalis.*

b^4. Forewing with series of short black streaks on the veins beyond postmedial line .. *rectilinea.*

b^2. Forewing with the ground colour ochreous yellow or red brown.

a^3. Forewing with blackish patches on costa at middle and before apex .. .. .. *bisignata.*

b^3. Forewing without blackish patches on costa.

a^4. Forewing with the postmedial line minutely waved and excurved beyond the cell.

a^5. Forewing with black discoidal spot .. *atripuncta.*

b^5. Forewing without black discoidal spot .. *ochracea.*

b^4. Forewing with the postmedial line not waved, angled at vein 6, then oblique .. .. *transversa.*

1869. ELYDNA OCHREIPUNCTA.

1878. ELYDNA RENALIS.

1878*a*. ELYDNA RECTILINEA.

Elydna rectilinea, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 172, pl. 141, f. 17 (1910).

Head and thorax whitish tinged with rufous, the head rather white; palpi fuscous, white at tips and in front; tarsi fuscous ringed with white; abdomen grey tinged with brown. Forewing pale grey tinged with pale reddish brown; subbasal line slight, dark, straight, from costa to submedian fold; antemedial line blackish, oblique, straight or slightly incurved in submedian interspace, slightly bent inwards to costa; orbicular represented by a minute dark point, the reniform by some white scales; a diffused dark medial shades oblique from costa to lower angle of cell, then blackish; postmedial line blackish, erect, straight, slightly bent inwards to costa, with minute black streaks beyond it on the veins; subterminal line indistinct, dark, rather diffused, excurved below vein 7 and at middle; a fine brown terminal line with minute white points at the veins; cilia grey-brown with a slight yellowish line at base. Hindwing whitish suffused with brown; a fine brown terminal line; cilia whitish with the yellowish line at base; the underside white, the marginal areas irrorated with brown, a brown discoidal lunule, diffused sinuous subterminal line and terminal series of black striæ.

Habitat.—PUNJAB, Kulu, Sultanpur, Dalhousie. *Exp.* 32 mill.

2058*a*. ELYDNA BISIGNATA.

2058*b*. ELYDNA ATRIPUNCTA.

Elydna atripuncta, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 175, pl. 141, f. 21 (1910).

♀. Head white, the palpi, frons, and antennæ except at base dark brown; thorax white tinged with ochreous and irrorated with a few black scales; tibiæ and tarsi brown; abdomen whitish dorsally tinged with ochreous and irrorated with a few dark scales except at base. Forewing white tinged with ochreous and irrorated with black scales, the terminal area tinged with rufous; antemedial line brown, double on inner area, oblique towards costa, then waved, angled outwards at vein 1; a round black discoidal spot; postmedial line brown, excurved and minutely waved to vein 2, angled inwards in submedian fold to near antemedial line and outwards on vein 1; subterminal line brown, diffused, oblique from costa to vein 7, incurved at discal and submedian folds; a series of small black spots before termen; cilia ochreous with a series of fuscous points. Hindwing whitish suffused with ochreous yellow especially on terminal area: the underside whitish, the costal and terminal areas irrorated with brown, a small discoidal spot.

Habitat.—CEYLON, Puttalam. *Exp.* 36 mill.

2058. ELYDNA OCHRACEA.

2057. ELYDNA TRANSVERSA.

Genus ANDROLYMNIA. *Type.*

Androlymnia, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 179 (1910) .. .. *emarginata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and slenderly scaled, the 3rd long; frons smooth, with large tuft of hair above; eyes large, round; antennæ of male somewhat laminate and almost simple; thorax clothed chiefly with scales, the prothorax with ridge-like crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing typically with the apex produced and acute, the termen excised below apex and excurved at middle, the inner margin with antemedial lobe and scale tooth; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from first below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2098. ANDROLYMNIA EMARGINATA.

Genus NICARA. *Type.*

Nikara, Moore, Lep. Atk., p. 126 (1882) .. .. *castanea.*

Proboscis fully developed; palpi upturned, short, the 2nd joint broadly scaled, the 3rd minute; frons smooth; eyes large, round; antennæ of male minutely ciliated; thorax clothed almost entirely with scales and without crests. Forewing rather short and broad, the apex rounded, the termen obliquely curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11

from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1792. Nicara castanea.

Genus Apocalymnia.

Type.

Apocalymnia, Hmpsn., Cat. Lep. Phal. B. M, ix, p. 184 (1910) .. .. *tenebrosa.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons with large corneous process with raised edges; eyes large, round; antennæ of female laminate; head and thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen slightly waved and somewhat excised towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1874*c*. Apocalymnia tenebrosa.

Genus Calymnia.

	Type.
Calymnia, Hübn. Verz., p. 235 (1827)	*trapezina.*
Eustegnia, Hübn. Verz., p. 236 (1827)	*diffinis.*
Euperia, Guen. Ann. Soc. Ent. Fr., 1839, p. 486 ..	*trapezina.*

A. Forewing with the postmedial line obliquely down curved from costa to vein 6.
  a. Forewing with wedge-shaped white patch on costa at postmedial line .. .. *restituta.*
  b. Forewing without wedge-shaped white patch on costa at postmedial line .. .. .. *flavifimbria.*
B. Forewing with the postmedial line oblique from costa to vein 6 .. .. *ochreimargo.*

2055. Calymnia restituta.
Cosmia restituta, Wlk., x, 490 (1856).
Calymnia picta, Stand. Stett. Ent. Zeit., 1888, p. 257, id., Rom. Mem., vi, p. 503, pl. 10, f. 2.

2056. Calymnia flavifimbria.
Cosmia affinis, Hmpsn., Moths. Ind., ii, p. 321 part. (nec. Linn).
Calymnia flavifimbria, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 193, pl. 141, f. 27 (1910).

1873. Calymnia ochreimargo.

Genus BASILICA.

	Type.
Basilica, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 209 (1910)	*chrysosticta.*

2689*a*. BASILICA CHRYSOSTICTA.

Genus MUDARIA.

	Type.
Mudaria, Moore, Indian Museum, Notes iii, p. 68 (1893)	*cornifrons.*

1825. MUDARIA CORNIFRONS.

Genus PHRAGMATIPHILA.

	Type.
Nonagria, Hübn. Verz., p. 241 (1827), Nec. Treit., 1825. . . .	*typhæ.*
Phragmatiphila, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 266 (1910).	*nexa.*

Proboscis aborted, minute; palpi porrect, hardly extending beyond the frons and fringed with long hair below; frons with transverse corneous plate at middle, square in front and concealed by hair; eyes large, round; antennæ of male typically serrate and fasciculate; thorax clothed with hair only, the pro and metathorax with slight spreading crests; tibiæ fringed with long hair; abdomen with some rough hair at base and dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 9 from 10 anastomosing with 8 to form a rather long areole; 6 from the areole or cell; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 on a long stalk; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate and fasciculate.

1978*a*. PHRAGMATIPHILA FUMEA.

Sect. II—Antennæ of male ciliated.

A. Forewing with the small reniform with dark centre and pale annulus open above and below . . *leucaneura.*

B. Forewing with the reniform a pale lunule . . *grisescens.*

1978*b*. PHRAGMATIPHILA LEUCANEURA.

Phragmatiphila leucaneura, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 269, pl. 143, f. 1. (1910).

♂. Head and thorax dark brown, the scales tipped with grey; pectus and legs dark brown mixed with greyish, the tarsi blackish ringed with white; abdomen greyish suffused and irrorated with dark brown. Forewing greyish ochreous strongly suffused and irrorated with dark brown, the veins of costal area with slight pale streak; traces of a curved blackish antemedial line; orbicular and reniform very small, ochreous, defined by black except above and with some black before and between them, the former rather triangular, the latter with black striga in centre; traces of an oblique blackish medial line from lower angle of cell to inner margin; an oblique postmedial series of slight black points on the veins from vein 6 to inner margin; an oblique, ochreous shade from apex; an oblique ochreous line from termen just below apex to inner margin, fine towards apex and broadening towards inner margin, defined on each side by dark brown suffusion; a terminal series of black points; cilia ochreous tipped with brown. Hindwing ochreous suffused with brown, the base and termen paler; the underside ochreous irrorated with brown, the terminal half suffused with brown, a dark discoidal spot.

Habitat.—BURMA, Hsipaw. *Exp.* 26 mill.

1798*c*. PHRAGMATIPHILA GRISESCENS.

Phragmatiphila grisescens, Hmpsn., Cat. Lep. Phal. B. M. ix. p. 270, pl. 143, f. 2 (1910).

♀. Head and thorax grey tinged with dull brown; pectus, legs and abdomen suffused with fuscous. Forewing grey tinged with brown and irrorated with fuscous, the cell and area just below it suffused with fuscous, the terminal area suffused with fuscous narrowing to a point at apex; traces of a blackish antemedial line bent inwards to costa and excurved in cell and submedian interspace; reniform a small ochreous lunule defined by black; traces of an oblique waved medial line from cell to inner margin; traces of a blackish postmedial line, oblique towards costa, then with series of black points beyond it on the veins, excurved to vein 4, then oblique; a terminal series of minute black lunules defined on inner side by slight ochreous lunules. Hindwing greyish suffused with fuscous brown; the underside brownish white irrorated with brown, a small dark discoidal spot.

Habitat.—SIKHIM, 1,800′. *Exp.* 34 mill.

Genus CALAMISTIS.

	Type.
Calamistis, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 273 (1910) ..	*fusca.*

Proboscis aborted, minute; palpi upturned, the 2nd joint reaching to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically bipectinate with moderate branches to apex; thorax clothed with long hair and hair-like scales, the pro-and metathorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with moderate branches to apex.

1942*a*. CALAMISTIS PRÆPALLENS.

Calamistis præpallens, Hampsn., Cat. Lep. Phal. B. M. ix, p. 275, pl. 143, f. 7 (1910).

♂. Head and thorax fuscous brown tinged with grey; hind legs whitish; abdomen white, slightly tinged with brown. Forewing grey-brown, the costal half paler; a diffused pale rufous fascia in discal fold from middle of cell to subterminal line; a black streak below basal half of cell; orbicular represented by a black point above median nervure, the reniform by a small fuscous spot at lower angle of cell slightly defined by white, its upper part defined by slight black points; a rather wedge-shaped black subterminal spot in discal fold with traces of black points on the veins from it to inner margin; a terminal series of slight black striæ. Hindwing white with fine dark terminal line; the underside with the costal area and terminal area to vein 3 tinged with pale rufous.

Habitat.—TRAVANCORE, Pirmad. *Exp.* 30 mill.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the inner half pale to subterminal line .. .. *microsticta.*

B. Forewing with the basal half of inner area concolorous .. .. *submarginalis.*

1793. CALAMISTIS MICROSTICTA.

1946. CALAMISTIS SUBMARGINALIS.

Genus RABILA. *Type.*

Rabila, Wlk., xxxii., 507 (1865) .. .. *frontalis.*

1591. RABILA FRONTALIS.

Genus ARENOSTOLA. *Type.*

Arenostola, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 281 (1910). *phragmitidis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately fringed with hair in front, the 3rd short, porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hairlike scales, the prothorax with slight spreading crest, the metathorax without crest; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1942*b*. ARENOSTOLA PROCERA.

Tapinostola procera., Staud. Stett. Ent. Zeit. 1889, p. 47; Hmpsn. Cat. Lep. Phal. B. M. ix, p. 286, pl. 143, f. 19; Staud, Cat. Lep. pal., p. 189.

Head and thorax ochreous white mixed with brown; palpi and legs brownish; abdomen ochreous white tinged with brown. Forewing ochreous white tinged with pale rufous and rather thickly irrorated with fuscous brown, the veins slightly streaked with brown; traces of a postmedial series of dark points on the veins, excurved to vein 4, then oblique; a terminal series of brown striæ. Hindwing white tinged with ochreous; the underside with the costal area and terminal area to vein 2 irrorated with brown.

Habitat.—W. TURKESTAN; E. TURKESTAN; MONGOLIA; KASHMIR, Numbra. *Exp.* 30-34 mill.

Genus SPHETTA. *Type.*

Sphetta, Wlk., xxxii., 457 (1865) .. .. *apicalis.*

1585. SPHETTA APICALIS.

Genus. ACRAPEX. *Type.*

Acrapex, Hmpsn. Moths Ind. ii, p. 286 (1894) .. .. *prisca.*
Acutipenna, Hmpsn. Moths Ind. ii, p. 287 (1894) .. *acuminata.*

Sect. I. (*Acutipenna*)—Antennæ of male annulated and ciliated.

1954. ACRAPEX ACUMINATA.

Sect. II. (*Acrapex*)—Antennæ of male ciliated and not annulate.

A. Forewing with hooked white mark above median nervure in lower extremity of cell .. .. *hamulifera.*
B. Forewing without hooked white mark above median nervure.
a. Forewing with dark shade along median nervure.
*a*¹. Forewing with pale streaks on the veins of costal area only .. .. .. *brunnea.*
*b*¹. Forewing with pale streaks on all the veins.
*a*². Head and tegulæ black.. .. .. *atriceps.*
*b*². Head and tegulæ not black.
*a*³. Forewing ochreous white tinged with fuscous brown .. .. .. *leucophlebia.*
*b*³. Forewing pale pinkish rufous .. .. *prisca.*
b. Forewing without dark shade along median nervure .. .. *roseotincta.*

1952. ACRAPEX HAMULIFERA.

1952*a*. ACRAPEX BRUNNEA.

Acrapex brunnea, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 318, pl. 144, f. 11 (1910).

Head and tegulæ dark brown slightly mixed with ochreous; thorax ochreous tinged with rufous; pectus and legs ochreous mixed with brown; abdomen ochreous suffused with brown. Forewing ochreous, the costal area suffused with red-brown leaving slight pale streaks on the veins; a diffused brown streak along median nervure and thence to the subterminal oblique fascia, with two white points on it at lower angle of cell; a slight brown streak below base of cell; an oblique pale fascia from apex to discal fold, with a diffused brown fascia below it from termen below apex to vein 3, with minute black streaks on it in the interspaces ; a terminal series of slight black lunules ; cilia ochreous mixed with brown and with brown line near base. Hindwing ochreous white, the veins and terminal area tinged with brown ; a fine brown terminal line ; cilia whitish with a slight brown line near base ; the underside whitish with the costal and terminal areas irrorated with reddish brown.

Ab. 1.—Hindwing more uniformly tinged with brown.

Ab. 2.—Forewing without the white points at lower angle of cell.

Habitat—BR. E. AFRICA ; UGANDA ; MASHONALAND ; GAZALAND ; TRANSVAL ; NATAL ; CEYLON, Maskeliya ; BORNEO, Pulo Laut ; BR. N. GUINEA ; QUEENSLAND ; S. AUSTRALIA. *Exp.* 20-30 mill.

1951b. ACRAPEX ATRICEPS.

Acrapex atriceps, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 319, pl. 144, f. 13 (1910).

♂. Head and tegulæ black ; thorax ochreous tinged with rufous ; with a black dorsal stripe ; pectus and legs dark brown, the hind tibiæ and tarsi ochreous above ; abdomen ochreous. Forewing pale ochreous slightly tinged with rufous, the veins defined by brown streaks except on inner area beyond the oblique subapical fascia, the costal edge black-brown : a diffused brown mark at lower angle of cell with white points in and beyond the angle defined by some black scales ; an oblique brown fascia from termen below apex to vein 3 where it is diffused inwards to lower angle of cell ; a terminal series of black striæ ; cilia with black line at middle and mixed with black at tips. Hindwing ochreous white slightly tinged with red-brown ; cilia ochreous white with a faint brown line at middle ; the underside whitish slightly irrorated with brown, the costal area suffused with brown.

Habitat.—ASSAM, Khasis. *Exp.* 26 mill.

1953. ACRAPEX LEUCOPHLEBIA.

1951. ACRAPEX PRISCA.

1951c. ACRAPEX ROSEOTINCTA.

Acrapex roseotincta, Hmpsn, Cat. Lep. Phal. B. M. ix., p. 320, pl. 144 f. 16 (1910).

♀. Head and thorax ochreous tinged with brown ; abdomen ochreous white. Forewing pale ochreous yellow faintly tinged with rufous and the veins slightly streaked with rufous ; a slight blackish streak below basal half of cell ; some black scales at lower angle of cell ; an oblique postmedial veins of black points on veins 6 to 1 ; an oblique diffused rufous fascia from termen below apex to vein 3 ; a slight brown terminal line cilia yellowish white with a faint brownish line through them. Hindwing white faintly tinged with ochreous ; the underside white with the costal area tinged with ochreous.

Habitat.—CEYLON, Maskeliya. *Exp.* 22 mill.

Genus Sesamia.

Type.

Sesamia, Guen. Noct. i., p. 95 (1852) .. .. .. *vuteria.*
Microsemyra, Butl. P. Z. S. 1883, p. 155 .. .. *pallida.*

Sect. I.—Antennæ of male bipectinate with extremely short branches, the apex serrate.

A. (*Microsemyra*), Hindwing with veins 3·4 strongly stalked in male from cell in female.

1950. Sesamia pallida.

B. Hindwing with veins 3·4 from cell in both sexes.

1943. Sesamia inferens.

Leucania inferens, Wlk. ix. 105 (1856); Moore, Lep. Ceyl. iii, p. 8, pl. 145, f. 3.
,, *proscripta*, Wlk. ix. 106 (1856).
Sesamia albiciliata, Snell, Tijd. v. Ent. xxiii., p. 44, pl. 4, f. 3 (1880).
,, *tranquillaris*, Butl. P. Z. S. 1880, p. 674.
Nonagria gracilis, Butl. P. Z. S. 1880, p. 675.
,, *innocens*, Butl. Trans. Ent. Soc. 1881, p. 173.

Sect. II.—Antennæ of male with fasciculate cilia.

A. Forewing ochreous slightly tinged with rufous .. *cretica.*
B. Forewing ochreous slightly tinged with olive .. *uniformis.*

1943*a*. Sesamia cretica.

Leucania hesperica, Frr. Neue Beitr vi, p. 32, pl. 501, f. 2 (1852). nec. Rmbr.
Sesamia cretica, Led. Noct. Eur., p. 225 (1857); Staud. Cat. Lep. pal. p. 190.
Nonagria cyrnœa, Mab. Ann. Soc. Ent. Fr. 1866, p. 559, pl. 8, f. 7 and 1867, p. 640, pl. 14, f. 1.
Sesamia fraterna, Moore, Lep. Atk. p. 103 (1882).
,, *striata*, Staud. Stett. Ent. Zeit. 1888, p. 27.

Head and thorax pale ochreous tinged with rufous; palpi, sides of frons and fore femora above brownish; abdomen ochreous white; forewing pale ochreous tinged with rufous especially on terminal half, the veins with slight pale streaks; faint fuscous streaks above and below extremity of median nervure, and beyond the cell above and below vein 4; sometimes with slight antemedial dark point in submedian fold and postmedial series of points on the veins with points before them in discal and submedian folds; a fine brown terminal line; cilia ochreous tinged with rufous and with fine pale lines at base and middle. Hindwing pure white.

Ab. 1.—*striata.* Forewing with dark streak below base of cell and streaks; on the veins of terminal area . . Asia Minor, Syria, W. Turkestan.

Habitat.—Corsica; Centr. Italy; Dalmatia; Crete; Egypt; Sudan; Basutoland; Aden; Asia Minor; Syria; W. Turkestan; Punjab, Kangra, Dharmsala; Sikkim. *Exp.* 30-42 mill.

Larva, Kirby, Eur. Butt. and Moths, p. 166; Hffm. Raup., p. 105.

Ochreous whitish; head rufous; spiracles black. Foodplant, in stalks of maize.

1943*b*. Sesamia uniformis.

Nonagria uniformis, Dudgeon, J. Bomb. N. H. Soc. xvi, p. 402 (1905).

Head and thorax pale ochreous slightly tinged with brown; palpi fuscous, whitish below; frons tinged with fuscous; fore and mid legs irrorated with fuscous; abdomen ochreous white. Forewing olive ochreous sparsely irrorated with dark brown; an antemedial black point in submedian fold; a slight diffused fuscous shade on extremity of median nervure and just beyond lower angle of cell; a slight black point in lower angle of cell and another in discal fold just beyond the discocellulars; postmedial black points in discal and submedian folds with races of a curved series of black points beyond them on the veins; a fine blackish terminal line not quite reaching apex and tornus; cilia ochreous white with faint brownish lines near base and tips. Hindwing pure white; the underside with the costal area slightly tinged with ochreous and irrorated with brown.

Habitat.—Bengal, Burogah; Bombay, Surat. *Exp.* ♂ 32, ♀ 34-38 mill.

Larva. Destructive to sugar-cane.

Genus Xylostola. *Type.*

Xylostola, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 335 (1910).. *indistincta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and broadly fringed with scales in front, the 3rd long; frons with small rounded prominence covered by a tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hair-like scales, and without crests; tibiæ fringed with rather long hair; abdomen with some rough hair at base, but without crests. Forewing with the apex rather produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with black lunules in centre and on outer edge of reniform.. .. .. .. *robusta.*

B. Forewing with the reniform defined by black points *indistincta.*

1945. Xylostola robusta.

1889. Xylostola indistincta.

Genus ARCILASISA.

Type.

Arsilasisa, Wlk., xxxii., 470 (1865) .. .. .. *sobria.*

1939. ARSILASISA SOBRIA.

Genus CLETHRORASA.

Type.

Clethrorasa., Hmpsn., Cat. Lep. Phal. B. M., ix., p. 343 (1910) .. .. *pilcheri.*

Proboscis fully developed ; palpi upturned, the 2nd joint smoothly scaled and flattened against the frons, the 3rd short ; frons smooth, eyes large, round; antennæ of male almost simple; thorax clothed almost entirely with scales and without crests ; tibiæ smoothly scaled ; abdomen with dorsal crests on basal segments. Forewing narrow, the margins subparallel, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell ; 6 from upper angle, 9 from 10 anastomosing with 8 to form the areole, 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from just below middle of discocellulars ; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1960*a*. CLETHRORASA PILCHERI.

Genus. APSARASA.

Type.

Apsarasa, Moore, P. Z. S., 1867., p. 665 .. .. *radians.*

A. Hindwing with the white patch extending almost to cell .. .. *radians.*

B. Hindwing with irregular white patch on termen.. *figurata.*

1962. APSARASA RADIANS.

1962*a*. APSARASA FIGURATA.

Apsarasa figurata, Moore, P. Z. S., 1877, p. 604; Hmpsn., Cat. Lep. Phal. B. M., ix., p. 347., pl. 144, f. 32.

♀. Head and thorax blue-black ; palpi with white spot on basal joint in front ; frons with yellowish white patch above; vertex of head and tegulæ at middle and tips with yellowish white bands ; pro- and meso-thorax with yellowish spots and meta-thorax with yellowish patch ; coxæ with white patches ; femora at extremities, tibiæ and tarsi, with white bands ; abdomen black-brown tinged with metallic blue, the two basal segments with yellowish white dorsal spots. Forewing blue-black, the costal terminal and inner areas with yellowish white patches leaving radiating blue-black bars and streaks ; the costal area with three small yellowish white spots on costal area followed by an oblique striga, then an erect striga, and irregular medial patch, a slight bar above end of cell followed by a striga, a triangular patch towards apex followed by an oblique bar and triangular patch at apex ; the terminal area with two short oblique streaks towards apex with point before the upper one, a minute streak at vein 5 and four oblique triangular patches between vein 4 and tornus; the inner area with small triangular antemedial spot followed by a striga, a broad medial band from submedian fold to inner margin extending to just above the fold at extremity, followed by a wedge-shaped spot, then a narrow bar and wedge-shaped spot towards tornus; a yellowish white point at middle of cell and another at upper angle. Hindwing black-brown with some white on termen between vein 4 and tornus, its inner edge very irregular and angled inwards below veins 4 and 3; the underside with antemedial white spot on costa, slight streak in base of cell, some whitish below base of cell, faint medial band from costa to discal fold, slight postmedial spots below costa and vein 8, two short subapical streaks and slender elongate streaks above and below discal fold.

Habitat.—ANDAMANS. *Exp.* 46-50 mill.

Genus CHASMINA.

	Type.
Chasmina, Wlk., ix, 146 (1856)	*tibialis.*
Sphragifera, Staud, Rom. Mén. vi, p. 544 (1892)	*sigillata.*
Clinophlebia, Hmpsn., Ill. Het. B. M., ix, p. 92 (1893) ..	*sericea.*

Sect. I. (*Clinophlebia*).—Forewing of male with the apex rectangular, the costa somewhat excised beyond middle and the costal neuration slightly distorted.

1957. CHASMINA SERICEA.

Sect. II (*Chasmina*).—Forewing with the apex rounded, the costa not excised, the neuration normal.

A. Forewing without subapical or postmedial dark patches.
  a. Forewing without postmedial line .. .. *tibialis.*
  b. Forewing with postmedial line .. .. *judicata.*
B. Forewing with sinuous dark patch from costa before apex .. .. *rejecta.*
C. Forewing with elliptical rufous patch in and beyond end of cell .. .. *maculata.*

1958. CHASMINA TIBIALIS.

Noctua tibialis, Fabr, Syst. Ent., p. 578 (1775).
Leocyma vestæ, Guen., Noct. ii, p. 213 (1852).
" *dianae*, Guen., Noct. ii, p. 213 (1852).
Chasmina cygnus, Wlk., ix, 147 (1856); Butl., Ill. Het. B. M., vi, p. 35, pl. 110, f. 3.
" *glabra*, Wlk., xxxii, 636 (1865).
Xanthodes, mariæ, Mab., C. R. Ent. Soc. Belg., xxv., p. lx (1884).

1959. CHASMINA JUDICATA.

1960. CHASMINA REJECTA.

Noctua rejecta, Fabr., Syst. Ent., p. 601 (1775).

Acontia bimacula, Wlk., xii, 796 (1857); Butl., Ill. Het. B. M., iii, p. 20, pl. 45, f. 8.

Chasmina stigmata, Hmpsn., Ill. Het. B. M., viii, p. 73, pl. 145, f. 10. (1891).

1961. CHASMINA MACULATA.

Genus CALLYNA.

Type.

Callyna, Guen., Noct., i, p. 112 (1852) .. .. .. *siderea.*

A. Abdomen with the terminal segments orange .. *siderea.*

B. Abdomen with the terminal segments not orange.

  a. Forewing with ante and postmedial black patches on costa .. .. *costiplaga.*

  b. Forewing without ante and postmedial black patches on costa.

    a^1. Forewing with dark fascia in discal fold between postmedial and subterminal lines.

      a . Forewing with the claviform represented by a small black spot .. .. .. *jugaria.*

      b^2. Forewing with the claviform absent.

        a^3. Forewing with the postmedial line dentate from costa to vein 4 .. .. .. *semivitta.*

        b^3. Forewing with the postmedial line oblique and straight from costa to vein 4. .. *mystica.*

    b^1. Forewing without dark fascia in discal fold between postmedial and subterminal lines .. *monoleuca.*

2169. CALLYNA SIDEREA.

2173. CALLYNA COSTIPLAGA.

2171. CALLYNA JUGARIA.

2171*a*. CALLYNA SEMIVITTA.

Callyna semivitta, Moore, Lep. Atk., p. 161 (1882); Waterh. Aid. ii., pl. 160, f. 3.

♀. Head deep chocolate brown mixed with some white; palpi with the 1st and 2nd joints white in front; thorax chocolate-red, the tegulæ white at base; pectus and legs brown mixed with white, the tibiæ and tarsi ringed with white; abdomen grey-brown, the ventral surface irrorated with white. Forewing chocolate red with a purple gloss, irrorated with a few white scales, the base and the area below the costa and the upper part of cell thickly irrorated with ochreous white to the postmedial line; subbasal line indistinctly double filled in with white, waved from costa to submedian fold; antemedial line defined on each side by ochreous white, waved, interrupted, obsolete below submedian fold, an oblique white striga before it across the cell; orbicular and reniform with white annuli defined by black, the former with some ochreous scales in centre, its outer edge produced to a streak connected with the reniform, which has an ochreous centre, narrow, rather constricted at middle and slightly angled inwards on median nervure; postmedial line double filled in with ochreous white, irregularly waved, oblique from costa to vein 4, below vein 3 represented by white points on the veins, a black-brown fascia from it to subterminal line in discal fold; some white points on postmedial part of costa; an apical ochreous white patch extending on to the cilia at apex and with dark striæ on it at termen and dark wedge-shaped mark before it below costa; the subterminal line represented by an excurved ochreous white mark below the apical patch and two points in discal fold, then very faint, incurved below vein 3 and with slight dark mark on it at submedian fold; a terminal series of white points. Hindwing fuscous brown with a cupreous gloss; the cilia greyish intersected with white at the veins and tipped with white between veins 6 and 4; the underside brown irrorated with white, especially on basal half, the inner area greyish, a brown discoidal lunule and diffused medial band, some white on termen between veins 2 and 1.

Habitat.—PUNJAB, Kulu; SIKKIM. *Exp.* 48-66 mill.

2172. CALLYNA MYSTICA.

2170. CALLYNA MONOLEUCA.

Callyna monoleuca, Wlk. xv., 1667 (1858).

Leocyma apicalis, Snell. Tijd. v., Ent. xxiii, p. 54, pl. 4, f. 9 (1880).

Genus SEUDYRA. *Type.*

Seudyra, Stretch, Cist. Ent. ii, p. 19 (1875) .. .. *transiens.*

Sect. I.—Palpi with the 3rd joint long; midwing with the termen slightly excised at submedian fold and the tornus lobed.

1571. SEUDYRA VENOSA.

Sect. II.—Palpi with the 3rd joint moderate; hindwing with the termen evenly curved.

A. Forewing with the apex produced, the termen obliquely curved.

a. Hindwing without discoidal spot .. .. *longipennis.*

b. Hindwing with black discoidal spot .. .. *catocalina.*

1572. SEUDYRA LONGIPENNIS.

1573. SEUDYRA CATOCALINA.

Phægorista catocalina, Wlk., xxxv. 1859 (1866); Butl. Ill. Het. B. M. v., p. 20, pl. 82, f. 9; Kirby, Cat. Lep. Het., p. 38.

Zalissa exigrifascia, Swinh., Cat. Het. Mus. Oxon. 1, p. 167 (1892).

B. Forewing with the apex not produced, the termen much less obliquely curved.

a. Both wings with the termen not crenulate.

*a*¹. Hindwing with the terminal band expanding into a large quadrate patch above tornus .. *bala.*

*b*¹. Hindwing with the terminal band not expanding into a large quadrate patch above tornus .. *transiens.*

1570. SEUDYRA BALA.

1569. SEUDYRA TRANSIENS.

Eusemia transiens, Wlk., vii. 1588 (1856); Kirby, Cat. Lep. Het. p. 38.

Phægorista catocaloides, Wlk., Journ. Linn. Soc. Zool., vi, p. 87 (1862).

Agarista ægoceroides, Feld. Reis. Nov., pl. 107, f. 10 (1878).

Seudyra dissimilis, Swinh. Trans. Ent. Soc., 1890, p. 174.

b. Both wings with the termen crenulate.

a. Forewing with curved white patch beyond the cell .. .. *albifascia.*

b. Forewing with quadrate white spot in end of cell .. .. *nepcha.*

1574. SEUDYRA ALBIFASCIA.

1575. SEUDYRA NEPCHA.

Genus. PROTOSEUDYRA.

Type.

Protoseudyra, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 443. (1910) .. .. *picta.*

Proboscis fully developed; palpi porrect, extending about the length of head, the 2nd joint moderately fringed with hair below, the 3rd short; frons with rounded prominence with minute pointed corneous process at middle; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hair-like scales and without crests; fore tibiæ fringed with long hair: the mid and hind tibiæ moderately fringed with hair; abdomen with very large crest of curled metallic scales at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1872. PROTOSEUDYRA PICTA.

Genus OPSYRA.

Type.

Opsyra, Hmpsn., Cat. Lep. Phal. B. M. ix, p. 445 (1910) .. *chalcoela.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to vertex of head and moderately fringed with scales in front, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of male minutely ciliated; thorax clothed chiefly with scales, the pro and metathorax with spreading crests of very long spatulate scales, the patagia fringed with long rough scales at extremity; tibiæ fringed with rather long hair; abdomen with large crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2174*a*. OPSYRA CHALCOELA.

Genus MICRAPATETIS.

	Type.
Micrapatetis, Meyr., Trans. Ent. Soc. 1897, p. 369 ..	*orthozona.*
Axiorata, Turner, P. Linn. Soc. N. S. W. xxvii., p. 120 (1902).	*leucozona.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd short; frons with rounded prominence; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with large spreading crest; tibiæ slightly fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7. 8. 9. 10 stalked; 11 from cell. Hindwing with veins 3·4 shortly stalked; 5 obsolescent from middle of discocellulars; 6-7 from upper angle or stalked; 8 anastomosing with the cell to near middle.

A. Forewing ochreous suffused with purplish red .. *pyrastis.*
B. Forewing dark red-brown with the basal area yellow .. *flavipars.*

1962*a*. MICRAPATETIS PYRASTIS.

Micrapatetis pyrastis, Hmpsn., Cat. Lep. Phal. B. M., ix. p. 454, pl. 146., f. 22 (1910).

♀. Head and tegulæ purplish grey; thorax pale purplish red; palpi, pectus and legs blackish mixed with grey; abdomen purplish red. Forewing pale purplish red, the basal half with an ochreous tinge; a medial leaden grey band defined at sides by black lines, slightly constricted at discal fold and strongly at submedian fold, some slight pale points beyond it on costa; cilia whitish at base, blackish at tips. Hindwing fuscous with a purplish grey tinge; cilia whitish with a fuscous line through them; the underside rather paler with faint diffused curved postmedial line.

Habitat.—MADRAS, Gooty. *Exp.* 18 mill.

1962*b*. MICRAPATETIS FLAVIPARS.

Micrapatetis flavpiars, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 454 pl. 146, f. 23 (1910).

♀. Head and tegulæ dark greyish brown; thorax ochreous yellow pectus, legs and abdomen greyish brown. Forewing with the basal area ochreous yellow defined by the fine black antemedial line, which is minutely waved and somewhat oblique, the base of costa with a brown fascia; the rest of wing dark red-brown with a silvery gloss; an indistinct diffused red-brown postmedial line. Hindwing reddish brown with a greyish tinge, a fine pale line at base of cilia.

Habitat.—BOMBAY. *Exp.* 18 mill.

Genus HYPOCALAMIA.

Type.

Hypocalamia, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 495 (1910) .. .. .. *meterythra*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd short; frons smooth; eyes larger, round; antennæ of male ciliated; thorax clothed with hair only and without crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1709. HYPOCALAMIA METERYTHRA.

(To be continued.)

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART VII.

(*With Plates XXXIII to XXXIX and text-figures 24 to 27.*)

(*Continued from page 391 of this Volume.*)

COPERNICIA, Mart. Hist. Nat. Palm. III, 242, t. 49, 50 (excl. t. 50, A I—IV).

(After Nicolaus Copernicus, the famous astronomer, 1473-1543.)

Kunth, Enum. Pl. III, 343.—Griseb. Fl. Brit. W. Ind. 544.—Benth. et Hook. f. Gen. Pl. III, 927 (excl. *Crysophila*).—Becc. in Webbia II (1907), 140.

Stem erect, mostly of considerable height, rarely low, annulate in the lower part, covered higher up with the bases of the persistent petioles. Leaves terminal, flabelliform. Petioles with strong spines and a ligule. Segments induplicate, often with fibres between the segments.

Spadices elongate-paniculate, much-branched, with several tubular spathes and superposed partial inflorescences, which are divided into several flower-bearing branchlets; each branchlet provided with a more or less tubular spathe or with a simple bract at the point of its origin. Flowers hermaphrodite, single or in clusters, sessile, bracteate or bracteolate. Calyx tubular, more or less deeply 3-dentate. Corolla more or less distinctly tubular below, divided in 3 valvate, narrow segments, which are strongly sculptured-alveolate on the inner side. Stamens 6; filaments united at the base with the corolla-tube and forming in the throat a 6-lobed or 6-dentate corona, suddenly restricted and subulate in the upper part, anthers ovate or oblong, dorsifixed. Ovary consisting of 3 carpels which are free below and united above into one common style; stigma tridenticulate.

Fruit globose or ovoid, formed by one carpel, with the rest of the abortive carpels at the apex; endocarp crustaceous-woody, thin. Seed free in the endocarp; hilum basilar; albumen deeply ruminate; embryo basilar near the hilum.

Species about 9.

DISTRIBUTION.—Brazil, Venezuela, Argentine, S. Domingo, Cuba, New Granada.

COPERNICIA CERIFERA, Mart. Hist. Nat. Palm. III, 56, t. 49 et 50 (excl. fig. 10) et 242 (partim).—Becc. in Webbia, II (1907) 145—*Corypha cerifera*, Man. Arruda da Camara, in Koster Travels in Brazil (1816) App. (ex. Mart. l. c. 56).

NAMES.—Brazilian Wax Palm; Carnauba (in Brazil).

DESCRIPTION.—Stem 30-40 feet high, cylindric, erect, at the base usually slightly thickened, 6-8 inches in diameter, covered with the bases of fallen leaves, either in the upper part only or throughout. Leaves $4\text{-}6\frac{2}{3}$ feet long, forming a large spherical crown. Petiole 2-3 feet long with the base dilated, depressed, a little concave above and convex below, armed on the margins with stout, compressed spines; ligule glabrous, semirotundate-oblong, finely coriaceous; rhachis 0; limb suborbicular in outline, flabelliform-multifid, undivided in the central part for about $1\text{-}1\frac{1}{3}$ feet from the apex of the petiole and on the sides only for about $\frac{4}{5}\text{-}1\frac{1}{5}$ inches, thinly coriaceous, cereo-pulverulent or whitish on both surfaces, divided into about 60 segments; central segments $2\frac{3}{5}$ feet long from the apex of the petiole and about $1\frac{2}{5}$ inches wide where broadest.

Spadices much elongate, erect-patent, 5-6 feet long, thrice divided, composed of several partial inflorescences which are alternately superposed. Primary spathes elongate, tubular, cylindric (at least above where they measure about $\frac{1}{2}$ inch in diameter), finely striate lengthwise, glabrous, obliquely truncate at the mouth where the margin is entire or scarcely reticulate-fibrous, prolonged on one side into a triangular, acute, dorsally carinate point; partial inflorescences laxly paniculate-elongate; panicles divided into 6-7 branches, each arising from within a tubular spathe which resembles the primary spathes except for being smaller and more attenuate in the lower part, branches densely pilose-velutinous in every part, with the peduncular part included in the respective spathe; flower-bearing branchlets alternate-distichous. Lower branches much larger than the upper ones, sometimes twice branched, bearing 10-12 and more flower-bearing branchlets. Flowering branchlets filiform, each arising from the axil of a thin, membranous, narrowly lanceolate-acuminate bract. Flowers in small glomerules, usually 2-4 together, alternate-spirally arranged, each with a minute bracteole. Calyx shortly tubular, $\frac{1}{12}$ inch in diameter, slightly longer than broad, obsoletely trigonous; segments acute. Corolla tubular for more than the lower half, divided into 3 broad deltoid teeth, 4-sulcate on the inner side. Stamens with their filaments united with the corolla-tube and forming a fleshy ring (at the mouth of the tube) which is provided with 6 small linear teeth; anthers dorsifixed, erect, small, shortly ovate, rotundate at both extremities; pollen exceedingly small, globose. Carpels forming a turbinate body, fleshy below, cartilaginous in the upper part, suddenly contracted into the style; stigma small, very shortly 3-lobed.

Fruit ovoid, sometimes globose-ovoid; mesocarp very small, with a few anastomosing-reticulate fibres; endocarp thinly parchment-like-woody, fragile. Seed free in the endocarp, $\frac{2}{3}$-$\frac{4}{5}$ inches long, $\frac{13}{24}$-$\frac{17}{24}$ inch broad, rotundate at both extremities; hilum at the base of one side; raphe occupying one side of the seed with 7-8 ramifications; albumen distinctly ruminate; embryo conical, basilar, slightly eccentrical.

HABITAT.—Brazil (Bahia, Pernambuco, Piauhy). Sometimes grown in Indian Gardens.

USES.—The berries, though bitter, are, either raw or boiled, eaten by the Indians; also the spadix is edible.

The leaves serve for a variety of purposes, such as thatch, pack-saddles, hats, etc., and in time of scarcity the young leaves are chopped up and given as fodder to horses and cattle.

The well-known vegetable wax is produced by the leaves of this palm. The young leaves, after they have been detached from the tree, are shaken, when each leaf yields about 50 grains of a whitish scaly powder, which is melted in pots over a fire; the wax then collects at the surface of the water. The Brazilians use the wax occasionally to adulterate bees' wax; it is, however, mostly imported into Europe for manufacturing candles and for various other purposes.[1]

From the juice of the palm arrack and syrup are prepared. The roots are used medicinally as a substitute for sarsaparilla.

From the inner part of the trunk the natives prepare for home consumption a kind of farina.

The wood, especially of the lower part of the adult tree, is very durable, and lasts for many years, even when exposed to the weather; for this reason the trunk is used for almost every purpose, especially for all the framework of houses and the enclosures for cattle. The wood is not less useful in the manufacture of musical instruments.

CULTIVATION IN EUROPE.—This species is a stove palm. It is best cultivated in a compost of two parts of loam, one of peat, and one of sand. Perfect drainage and liberal supply of water are required.

II.—BORASSINÆ.

Spadix simple or little branched with thick cylindrical twigs; flowers markedly diclinous, dimorphic, invested with bracts, the male in 1-8 cincinni in grooves of the twigs; carpels 3, fully united, producing a 1-seeded drupe; leaves fan-shaped, induplicate. The only tribe is:

3. BORASSEAE.

DISTRIBUTION.—Tropical Africa from Guinea to Egypt and Natal, Mascarine Islands, Seychelles Islands, Coast of Arabia, East Indies, Philippines, New Guinea, Borneo, Sumatra.

The tribe comprises the following genera: *Pholidocarpus*, *Medemia*, *Hyphæne*, *Latania*, *Borassus*, *Lodoicea*.

KEY TO THE GENERA DESCRIBED BELOW.

Stamens 6.—Fruit by the abortion of 2 carpels unilocular with one central woody, ovate stone ... ... *Hyphæne*.

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[1] Gissern, P. Die Amerikanische Carnaubapalme und die Gewinnung des Carnaubawachses. Seifens Ztg. Augsburg, 28 (1901) 581, 597-598.

Zimmermann, A. Die Wachspalme (*Copernicia cerifera*). P. flanzer, Tanga, 3 (1907), 191-195.

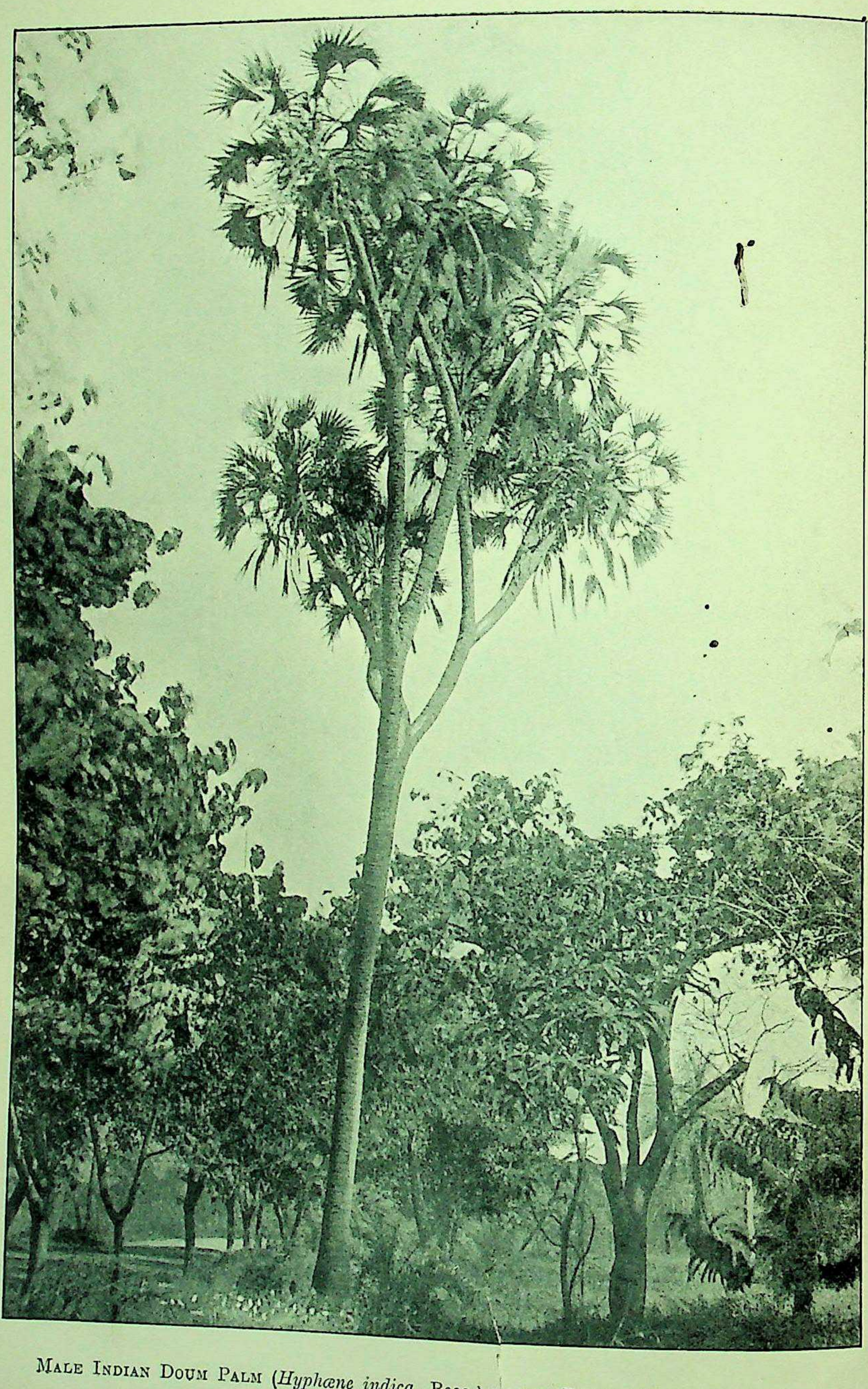
Stamens 8.—Fruit with 3 bony stones, or rarely by abortion with 1 or 2	*Latania.*
Stamens 6.—Fruit mostly with 3 stones; seed sinuate	*Borassus.*
Stamens 8.—Fruit generally with one bilobed, kidney-shaped stone; seed bilobed	*Lodoicea.*

HYPHÆNE, Gaertn. Fruct. I (1788) 28, t. 10, f. II (1791) 13, t. 82.

(From the Greek 'Hyphaino,' to weave, alluding to the fibres of the fruit.)

Benth. & Hook. Gen. Pl. III, 940.—Dalla Torre et Harms Gen. siph. p. 38.—*Douma* (Poir.) in Nouv. Duhamel ed. 2, IV (1801-9). —*Cucifera* Del. Fl. d'Egypte (1813), 145.—*Doma* Lam. Illustr. t. 900.—*Camæriphes* Dill. Cat. pl. Schawii No. 143 (1738).—O. Kuntze Rev. Gen. II (1891) 728 (non *Pontedera*). Baillon Hist. des Fl. XIII, 324.

Unarmed except for the spines on the petioles. Stem cylindrical or ventricose, simple or dichotomously branched. Leaves in a terminal crown, orbicular or flabellate; segments ensiform, petiole concavo-convex, plano-convex or more rarely bi-convex; sheath short, open; ligule oblique or equilateral. Spathes cylindrical, incomplete; spadices diœcious, male and female similar; spadix branches alternate; flower-bearing branches subfastigiate; bracts semicircular, very densely imbricate; bracteoles membranous, bearded. Male flowers: Sepals linear-oblong, imbricate, connate at the base. Petals broadly ovate, obtuse, concave, imbricate, connate at the base into a short stalk. Stamens 6; filaments short, subulate; anthers linear, inserted at the bifid base. Rudiment of ovary 0. Female flowers larger than the male, very shortly pedicellate. Sepals 3, ovate-orbicular, obtuse, imbricate. Petals a little smaller than the sepals, broadly ovate, obtuse, imbricate. Staminodes 3, connate into a membranous ring. Ovary subglobose, obscurely 3-lobed, 3-celled; stigmas 3, minute, sessile, terminal, at length excentric; ovule attached by a broad base to the side of the cell.



MALE INDIAN DOUM PALM (*Hyphæne indica*, Becc.) IN THE Ba[illegible] BOTANICAL GARDEN.

Fruit sessile or stalked, terete or obscurely lobed, often flat or intruded at the base and apex, 1-celled; stigma basal; pericarp fibrous, with a shining epidermis; endocarp woody, fleshy inside. Seed adnate to the endocarp, erect, ovoid or obovoid, intruded at the base; testa very hard, fuscous; raphe reticulately branched; albumen homogeneous, hollow; embryo apical.

Species at least 40.[1]

DISTRIBUTION.—All over tropical and subtropical Africa, Arabia, Western India.

INDIGENOUS SPECIES.

HYPHÆNE INDICA, Becc. in Aricoltura Coloniale, II (1908) fasc. III.—*Borassus dichotoma*, White in Graham Cat. of Plants of Bomb. (1839), 226. Mart. Hist. Nat. Palm. III, 318, n. 179.

NAMES.—Indian Doum Palm; Oka mundel (in Gujarat).

DESCRIPTION.—Stem dichotomously branched, similar in general aspect to that of *H. thebaica*. Leaves flabellate-multifid, suborbicular, measuring $3\frac{2}{3}$ feet from the apex of the petiole to the end of the central segments. Central segments rather much smaller and shorter than the intermediate ones, not inserted at the apex of the petiole, but at various heights on the stout rachis which reaches almost half-way up the limb. Petiole about $3\frac{1}{3}$ feet long and about $\frac{4}{5}$ inch broad at the apex, regularly rounded on the under side, channelled on the upper side of the lower part and almost flattened near the apex, where it is plano-convex in a transverse section, armed with stout, uncinate, black spines with broad base. Ligule very irregular and asymmetrical, being much more developed on one side of the limb than on the other,

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[1] On Hyphæne see:—

Beccari, O. Palmarum Madagascariensium Synopsis. Engl. Bot. Jahrb. Vol. 38 (1906), Beibl. No. 87, p. 1-41.

Beccari, O. Le Palme 'Dum' od Hyphæne e più specialmente quelle dell Africa Italiana. In 'Agricoltura Coloniale,' Anno. II, fasc. III. Firenze 1908, p. 137-183.

Carstensen, G. Doum Palms in India, Journ. Bombay Nat. Hist. Soc. VI, 271.

Dammer, U. Ueber Hyphæne. Engl. Bot. Jahrb., 30 (1901), 267.

Thiselton-Dyer. Flora of Tropical Africa, Vol. VIII.

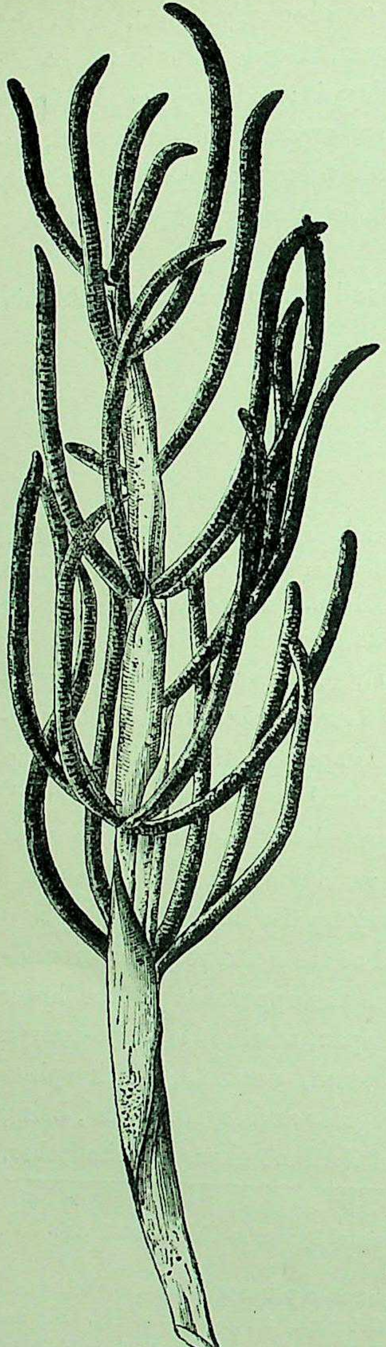
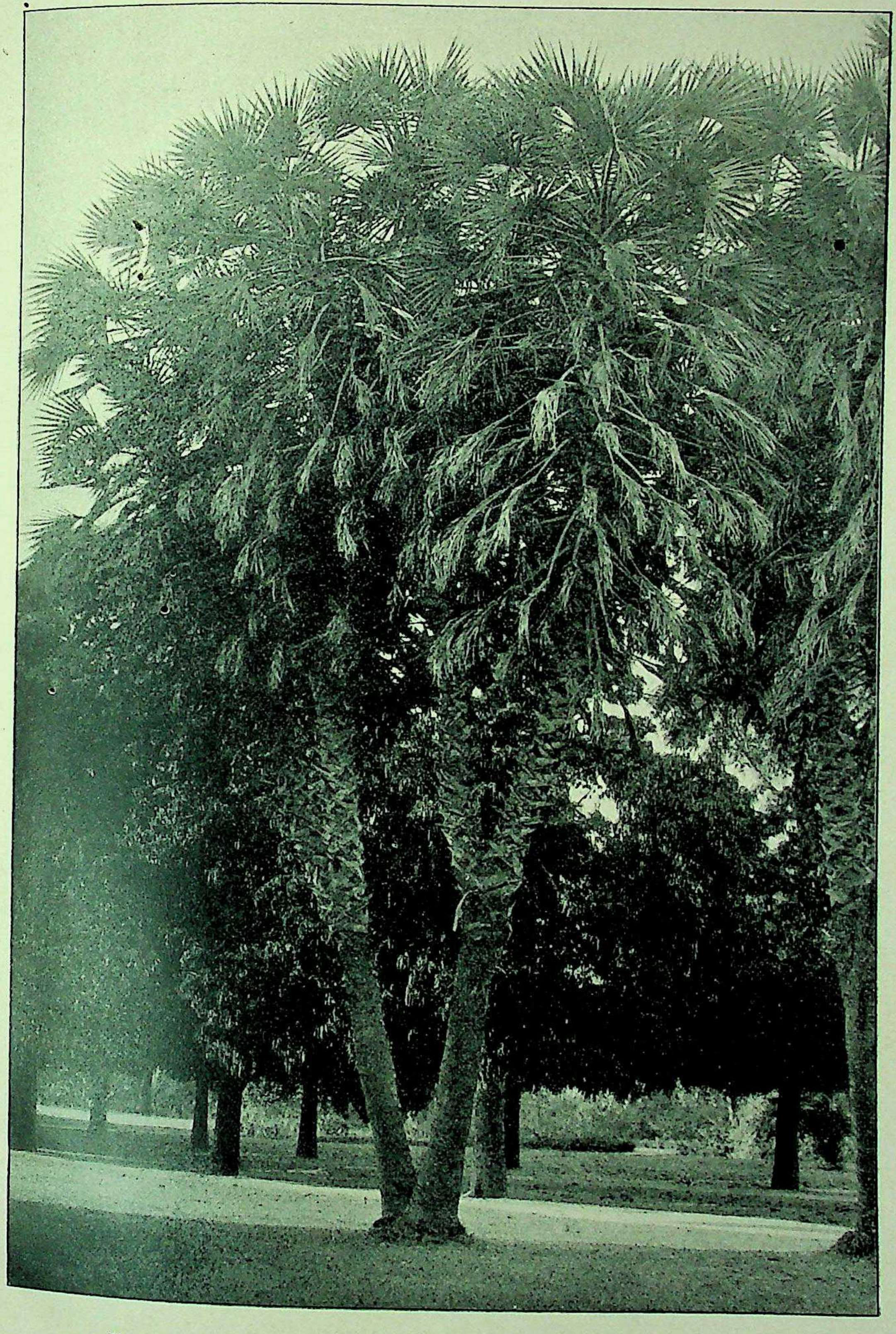


FIG. 24.—Male Spadix of *Hyphæne indica.*

margin subligneous, irregular and spinulose. Segments about 40; those of the middle portion of the sides are the largest and separate from each other about $\frac{2}{3}$-1 foot from the ligule; segments gradually narrowing into a very acuminate point which is divided for the distance of $3\frac{1}{5}$-4 inches into 2 secondary, rigid, very acuminate points; primary ribs of under surface rather stout and marked with small impressions; ribs of upper surface slightly weaker and finely punctulate-impressed under the magnifying glass.

Male spadix (Fig. 24) rather stout about $3\frac{1}{3}$ feet long (in Beccari's specimen) and about $1\frac{3}{5}$ inches in diameter at the peduncular part. Spathes tubular, ending at the apex on one side in a triangular, acuminate limb, covered all over with a dense woolly tomentum which is difficult to remove; branches of spadix about 6, the lowest 1 inch in diameter, bearing about 6 flowering branchlets digitately arranged, the next bearing 5, and the apical branch which is biconvex and only $\frac{1}{3}$ inch in diameter bearing only 2; the branches arise from their respective spathe. Branchlets $\frac{2}{3}$-$\frac{5}{6}$ feet long, $\frac{3}{8}$-$\frac{2}{5}$ inch in diameter, the axillary part tough and subligneous, no flowers at the base for the distance of about $\frac{2}{5}$ inch. Flowers 3



FEMALE INDIAN DOUM PALM (*Hyphæne indica*, Becc.) GROWING AT BARODA.

for each scale and rising from it successively, having the appearance of small straw-coloured globules. Segments of corolla rigid and parchment-like, rotundate, and very strongly striate-nervose; at the apex the flowering branchlets are suddenly narrowed into a small obtuse tail about $\frac{1}{5}$ inch long and devoid of flowers.

Female spadix not known.

Fruit pretty regularly obovate-pyriform, markedly and gradually attenuate towards the base, subhemispheric or almost regularly rotundate in the upper third, laterally slightly compressed, devoid of a distinct keel, with numerous and small inequalities on the surface; base somewhat irregular with small gibbosities and only 1-$1\frac{1}{5}$ inches broad, whilst in the upper third the antero-posterior diameter of the entire fruit is $2\frac{2}{5}$-$2\frac{3}{5}$ inches and the transverse diameter 2 inches; total length of fruit $3\frac{3}{5}$ inches; pericarp very large in comparison with the seed; sarcocarp well developed, $\frac{2}{5}$ inch thick on the sides and $\frac{1}{2}\frac{1}{4}$-$\frac{1}{2}$ inch at the base and apex; endocarp $\frac{1}{4}$-$\frac{7}{24}$ inch thick on the ventral side, thinner on the other side and slightly thicker below and above, regularly incurved at the apex above the seed, leaving a broad opening in its tissue for the plumule to pass through at the time of germination. Seed slightly above the centre of the fruit, obovate, $1\frac{2}{5}$ inches long and 1 inch broad towards the upper third, from where it gets very little narrower towards the flattened base; the upper part is broadly conical and the apex very obtuse; albumen $\frac{7}{24}$-$\frac{1}{3}$ inch thick, the cavity being conform to the shape of the seed. Embryo perfectly apical.

Pedicel $\frac{1}{2}$ inch long, comparatively slender, $\frac{7}{24}$ inch broad at the base and then restricted to a kind of neck; perianth-lobes opaque, puberulous, non-striate.

HABITAT.—Gujarat: Diu (Burkill), "passim in Guzerat," frequens in insula Diu (Vaupel), Ahmedabad, lat. bor. 23° (Car. de Hügel), probably all along the Western Coast of India down to Goa (Gammie).

NOTE.—There are specimens of a species of Hyphæne growing at Jaffna in Ceylon; but whether they are identical with the Indian Doum Palm or not, has not been decided as yet.

ILLUSTRATIONS.—Plate XXXIII shows a male tree of *Hyphæne indica* growing in Bassein Bot. Garden on the island of Salsette.

Mr. G. A. Gammie, to whose kindness we owe the photographs reproduced on this and the next plate, informs us, that there is only one specimen of the Indian Doum Palm growing at Bassein and that this tree supplied part of the material on which Dr. Beccari founded his *Hyphæne indica*.

Plate XXXIV shows a female tree growing at Baroda.

* * INTRODUCED SPECIES.

HYPHÆNE THEBAICA, Mart. Hist. Nat. Palm. III, 226 (ed.1), 225 (ed. 2) excl. syn. nonnullis, tab. 131, 132, 133 (excl.—*ic.* spadicis masculæ in tab. 132); Becc. in Agricolt. Colon. (1908) II, fasc. III.—*Corypha thebaica*; Linn. Sp. Pl. ed. 2, (1763) 1657.—*Cucifera thebaica*, Delile, Descr. de l'Egypte II, 57, t. 1, 2; Dict. d' Hist. Nat. XIII (1819), 472.—*Douma thebaica*, Poir. Encycl. Suppl. II, 519.—*Hyphæne cucifera*, Pers. Ench. II, 2245.--*Chamæriphes thebaica*, O. Kuntze, Rev. Gen. Pl. II (1891) 728.

NAMES.—Egyptian Doum Palm, Gingerbread Tree; Mama (in Egypt).

DESCRIPTION.—Stem terete, 10-30 feet high, about 1 foot in diameter, simple or more frequently dichotomously branched. Leaves 20-30 in a terminal crown on each branch; petiole sheathing at the base, triangular below, plano-convex upwards, spiny on the margins, with rusty tomentum; lamina suborbicular; lobes 20 or more, linear-lanceolate, acuminate, 1½ feet long, 1 inch wide; primary nerves thick, concave above, secondary numerous.

Male spadix about 4 feet long, 1-2 inches thick at the base, at first erect, afterwards patent; spathes nearly cylindrical; flower-bearing branches 6-7 inches long, 3-2 at the end of branches 3-4 inches long; bracteoles ½ line long. Flowers in pairs, shortly pedicellate. Calyx divided down to the base into 3 narrow, acute, yellow sepals, contracted below. Corolla stipitate with the segments imbricate, rotundate and cucullate at the apex, thin and not strongly striate-nervose. Stamens 6, rarely 7; filaments subulate from a thickened base; anthers linear, slightly sagittate, nearly basifixed. Rudiment of ovary consisting of 1-3 small and short unequal points.

Female spadix like the male; bracteoles densely imbricate, with a transverse line of tomentum half-way up the back. Flowers very shortly pedicellate, calyx-lobes orbicular-ovate, light green. Petals smaller than the sepals, orbicular-ovate, concave. Staminodes 6. Ovary globose or 3-lobed; stigmas sessile or nearly so.

Fruit more or less obliquely ovoid or oblong, irregular, usually a little more constricted in the upper part than in the middle and lower part, always much longer than broad, $2\frac{4}{5}$-$3\frac{1}{5}$ inches long and $2\frac{1}{5}$-$2\frac{1}{5}$ inches broad, more or less obtusely triangular in transverse section, with the abortive carpels often much developed; surface rather irregular and usually very distinctly punctate-impressed. Sarcocarp rather strongly impregnated with sugar; wall of endocarp $\frac{1}{12}$-$\frac{1}{8}$ inch thick on one side, on the other (which corresponds to an obtuse longitudinal keel), $\frac{1}{6}$-$\frac{1}{5}$ inch, not thicker below than on the sides and not incurved at the apex of the seed; fulcrum of seed much depressed and little developed. Seed more or less ovate-conical and flattened at the base, always much attenuate above and, therefore, more or less pyriform, almost circular in transverse section, $1\frac{2}{5}$-$1\frac{3}{5}$ inches long, $1\frac{1}{12}$-$1\frac{1}{8}$ inches broad.

The fruit varies a good deal by being more or less attenuate above. A longitudinal section of the fruit of *H. thebaica* and *H. indica* is given on page 930 of Vol. XVIII of this journal illustrating a short note on 'The Indian Doum' by I. H. Burkill.

HABITAT.—Along the valley of the Nile in Middle and Upper Egypt; Shaikh Othman near Aden.

HISTORY OF THE DOUM PALM.—Eighteen centuries already before Christ we find the Doum Palm in the middle course of the Nile. Anna, an officer of Thutmes I. (18th dynasty), superintendent of the granaries of Amon and director of the royal works, enumerates with great complacency on the inscription of his tomb[1] the trees which he had planted in his garden. Amongst them there were not less than 120 Doum Palms. If the fruits discovered by Flinders Petrie at Kahun were not introduced from Æthiopia, we must even admit that the tree was planted in Egypt 800 years before that period.[1]

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[1] Brugsch. H. Recueil de monuments égyptieus. Leipzig, 1862: part I, p. 48, pl. XXXVI.

Moldenke, C. E. Ueber die in alta gyptischen Texten erwähnten Bäume und deren Verwerthung. Leipzig, 1886, p. 18.

Boussac, H. Le tombeau d'Anna (Mém. de la mission archéol. au Caire, 1896, t. xviii, fasc. 1, pl. s. n.).

The palm received its native name 'Mama'[2] (which means "divided in two") from the fact that the stem of the tree is usually bifurcate. Theophrast, too, (371-286 B.C.) who calls the palm cucifera (*κουκιὸφοςος*) makes this the distinctive character of the tree :

"The tree," he says,[3] "which is called cucifera, shows with regard to its trunc and leaves a great resemblance to the Date Palm, but it is distinguished by the fact that, whilst the stem of the Date Palm is simple and entire, its trunc is divided into two branches, each of which in its turn is split up into two secondary branches, which bear short and few branches."

The Doum Palm is usually shown with the bifurcate stem on the pictures of the Egyptian tombs. There is one of them which represents the general arrangement as well as all the details of the parc of an officer of Amenhotpu II., the seventh king of the 18th dynasty. Sycamores, Date-Trees and Doum Palms play an important part in the artistically laid out garden.[4] On a picture from one of the tombs of Tell-el-Amarna[5], on the contrary, the artist represented the Doum Palm with a simple stem, but with the characteristic fan-shaped leaves.

The fruits of the Doum Palm which have been found in immense quantities in the pharaonic tombs and specimens of which may be seen in every Egyptian museum of Europe, are remarkable for their shape and size.

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[1] Joret, C. Les Plantes daus l'Antiquité et au Moyen Age. Paris, 1897, I, 108.

[2] Moldenke, C. E. l. c. p. 66.

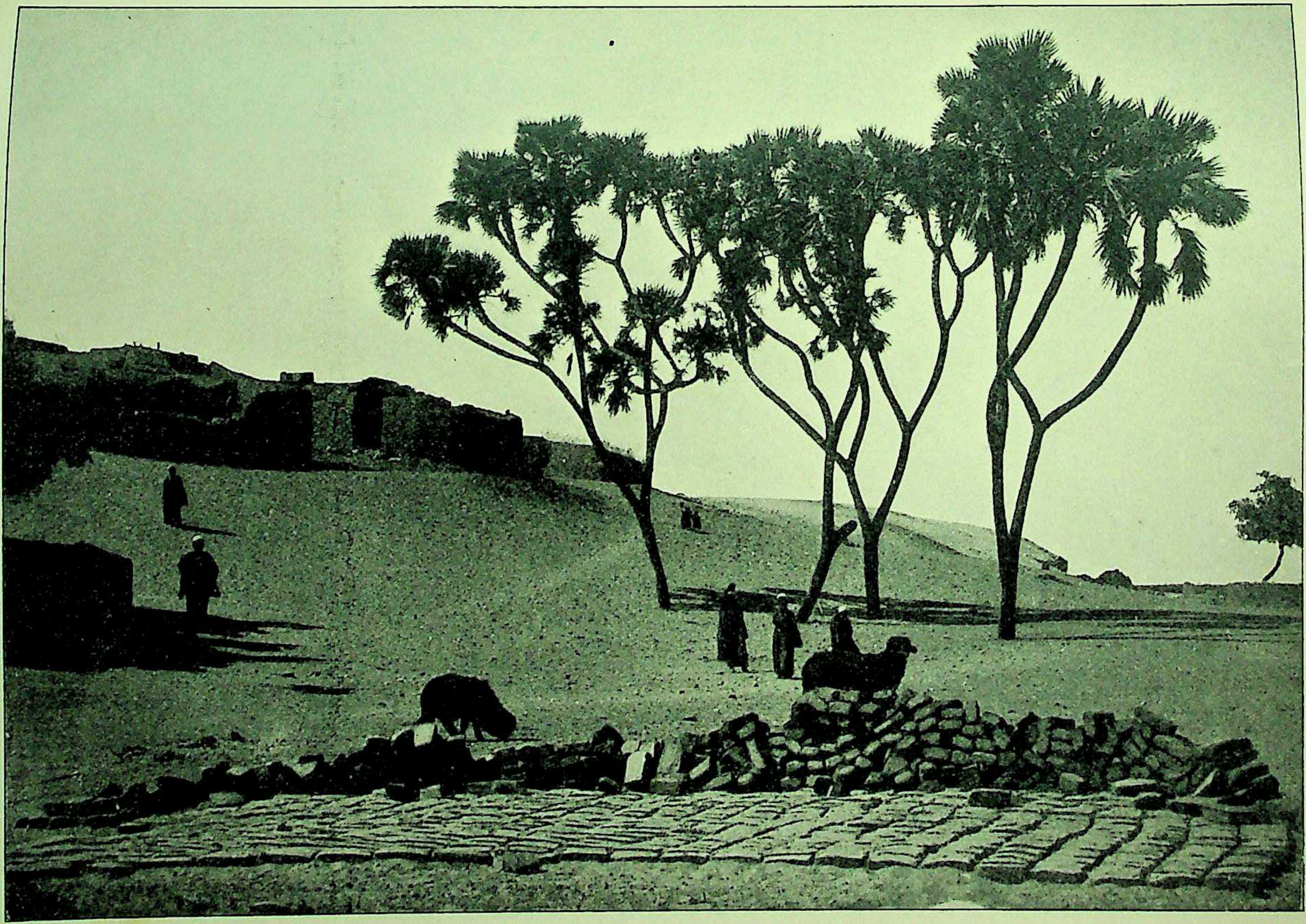
[3] Theophrastus. Historia plantarum, lib. iv, cap. II.

[4] Wilkinson, G. The manners and customs of the ancient Egyptians. London 1878, vol. I, p. 377, pl. 150.

Woenig, F. Die Pflanzen im alten Aegypten. Leipzig, 1886, p. 232.
Moldenke, C. l. c. p. 41.

Maspero, G. Histoire ancienne des peuples de l'Orient. Paris, ed. 4, 1886. vol. I. p. 291.

[5] Lepsius. Denkmäler, vol. III, pl. 95.



EGYPTIAN DOUM PALM (*Hyphæne thebaica*, Mart.).

"They differ from the dates," says Theophrast[1], "by their dimension, their shape and their taste; large enough to fill one's hand they are round and not oblong; being of yellow colour they contain a sweet and agreeable juice. They are not arranged in bunches like the dates, but grow isolated. The kernel is large and very hard."

The fruits were called 'ququ' in ancient[2] Egypt and it is not difficult to recognise in this word the root of Theophrast's *κουκι* (of the word *κουκιὸφοςος*).

Uses.—The leaves of younger plants are eaten by camels. The old leaves are put to many minor uses.

The trunk is used for making water conduits, "and it is possible," says Burkill, "that it might contain a little sago in just the same measure as the common Indian fan palm, enough to make it a famine food."

The thick fleshy-fibrous part of the fruit resembles gingerbread both in colour and taste, hence the palm is often known as the Gingerbread Tree.

The chief use of the palm is for the manufacture of buttons from the hard inner fruit-wall. It is also turned into beads for rosaries.

Cultivation in Europe.—The Doum Palm is difficult to cultivate. It grows best in rich sandy loam. Fresh seeds vegetate readily, but the young plants are of slow and precarious growth.

Cultivation in India.—Old specimens of the Egyptian Doum Palms may be seen in many a garden of India and Ceylon, and, as a rule, they are much better developed than the tree growing in Egypt. The climate seems, indeed, to exercise a great influence upon the development of this palm. When Haeckel saw the Doum Palm in Ceylon he was surprised to find it there under an aspect so altered that he could scarcely recognize them.

"Adaptation," he says, "to perfectly different conditions of existence have made the Doum Palm of Egypt quite another tree in Ceylon. The trunk is developed to at least double the thickness, much larger than in its native land; the forked branches are more numerous but shorter and more closely grown; the enormous fan-leaves are much larger, more abundant and more solid; and even the flowers and fruit, so far as my memory served me, seemed to be finer and more abundant. At any rate, the whole habit of the tree had so greatly changed in the hothouse climate of Ceylon that the inherited physiognomy of the tree had lost many of its most characteristic features. And all this was the result of a change of external conditions and consequent adaptation, more particularly of the greater supply of moisture which had been brought to bear, from its earliest youth, on a plant accustomed to the dry desert climate of North Africa. These splendid trees had been raised from Egyptian seed, and in twenty years had grown to a height of thirty feet." (A Visit to Ceylon, p. 180.)

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[1] Theophrastus l. c. lib. IV, cap. 2, 7.

[2] Loret, V. Recherches sur quelques plantes. I. Les Palmiers d'Egypte. (Recueil de travaux relatifs à la Philologie et à l'Archéologie égyptiennes et assyriennes, t. II, p. 24.

Joret, C. Des noms de palmier (Revue des études grecques. Paris (1892), p. 417.

ILLUSTRATION.—Not having at our disposal a good photograph of an Egyptian Doum Palm growing in India, we reproduce on Plate XXXV a photograph of some characteristic specimens which grow at Shaikh Hammed, near the ruins of Athribis and Dair-el-Abiadh in Egypt.

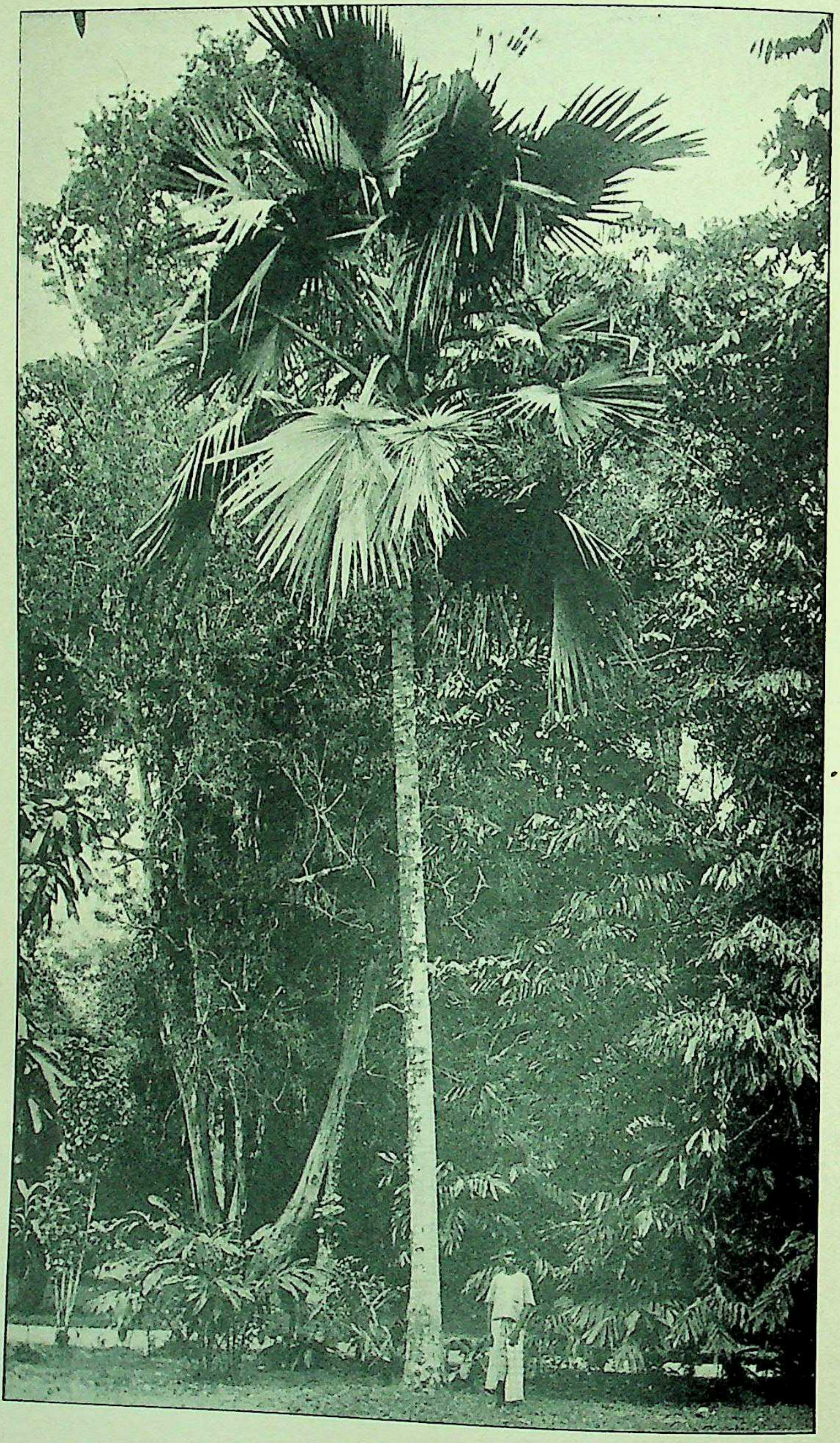
LATANIA, COMM., Juss. Gen. 39.

(After the vernacular name "Latanier" of *Latania burbonica*, Lam., now *Livistona chinensis*, R. Br.).

Gaertn. Fruct. II, 185, t. 120.—Jacq. Fragm. t. 8.—Mart. Hist. Nat. Palm. III, 222, t. 148.—Illustr. Hort, t. 229.—Baker Fl. Maurit, 380.—Benth. & Hook. Gen. Pl. III. II, 940, 118.

Of moderate height; leaves long-petioled, palmate-flabelliform; blade deeply laciniated.

DIŒCIOUS.—Flowers in distichously-branched axillary spadices, each branch sheathed by an obliquely truncate spathe. Male: Spikes cylindrical, with pits formed by the union of imbricating bracts, each pit containing a single flower; perianth-lobes imbricate; stamens 15-30, exserted; filaments connate at the base; pistillode a triquetrous column or of 3 or more subulate processes. Female: Bracts toothed on their outer edge, combined in pairs to form a cup for each flower; flowers fewer than in the male spikes; staminodes forming a toothed cup; ovary 3-celled; stigmas 3, distinct.



COMMERSON'S LATANIA (*Latania Commersonii*, Gmel.).

Fruit a drupe, containing 3 or, by abortion, 1-2 pyrenes; mesocarp succulent; pyrenes convex and sculptured externally; seed with a testa which adheres completely to the endocarp; albumen homogeneous; embryo apical.

Species 3.

DISTRIBUTION.—Mascarene Islands; generally introduced in Indian gardens.

CULTIVATION IN EUROPE.—The species of Latania are very handsome stove plants. They grow well in a compost of two parts of rich loam and one of peat, to which may be added a small quantity of sand. Perfect drainage is required. Propogation is effected by seeds. These are sown in a compost similar to that just mentioned, and placed in a moist, gentle heat.

LATANIA COMMERSONII, Gmel. Syst. II. 1035; Bory de St. Vinc. Voy. dans les ïsles de l'Afrique; Mart. Hist. Nat. Palm. III. 223, t. 148, fig. 4, t. 154, 161, fig. 2, t. W; Baker Fl. Maurit. and Seych. 381.—*L. playæcoma*,———Comm. Mss. et Palmarium Vol. t. 26, 27, 28; Aub. Pet Thouars Mèlanges de Bot., Observat. sur les Plant. des ïsles d'Afr., 51.—L. *rubra* Jacq. Frag. bot. 13, n. 49, t. 8; Willd. Spec. Plant. iv. 2. p. 878, n. 1; Spreng. Syst. Veg. ii. 623, n. 1.—*Cleophora lontaroides*, Gaertn. Fruct. —II. 185, t. 120, fig. 1.

NAMES.—Commerson's Latania; Latanier; Latanier rauge; Latanier de l'ïsle de Bourbon.

DESCRIPTION.—Palm 40 feet high. Petiole 4-6 feet long, slightly tomentose, the margins smooth, spiny in young plants; blades 5-$5\frac{1}{2}$ feet long, dark green above, paler beneath; segments lanceolate, acuminate, 2 feet long, $3\frac{1}{4}$-$3\frac{1}{2}$ inches broad, their margins entire, spiny in young plants; veins and margins tinged with red. Male spadix 3-6 feet long, with 9-16 branches; spikes 7-10 inches long, $\frac{1}{4}$-$\frac{1}{3}$ inch broad, arising in clusters of 4-20 from the end of the branch within the mouth of the spathe. Perianth $\frac{1}{6}$ inch long; margin of segments fringed; stamens 28-32; pistillode pyramidal-trigonous. Female spadix 3-6 feet long, with 8 or more branches, each bearing 3 spikes; free portion of bracts deltoid. Fruit a drupe, globose, $1\frac{1}{2}$-$1\frac{3}{4}$ inch in diameter; pyrenes obovoid, $1\frac{1}{6}$-$1\frac{1}{2}$ inch long, marked with numerous ridges which pass from

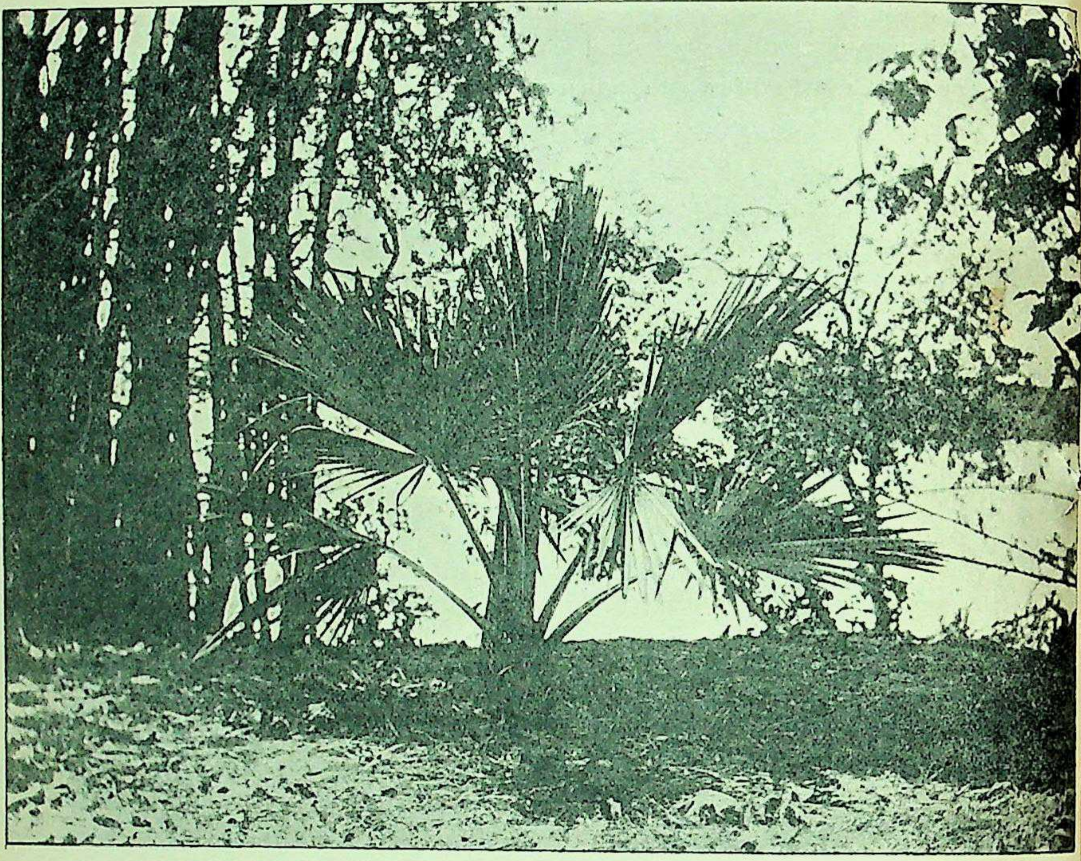


Fig. 25.—A young specimen of *Latania Commersonii*, Gmel.

the base to the apex and then curve down again, a central ridge always most prominent; seed with a light brown testa.

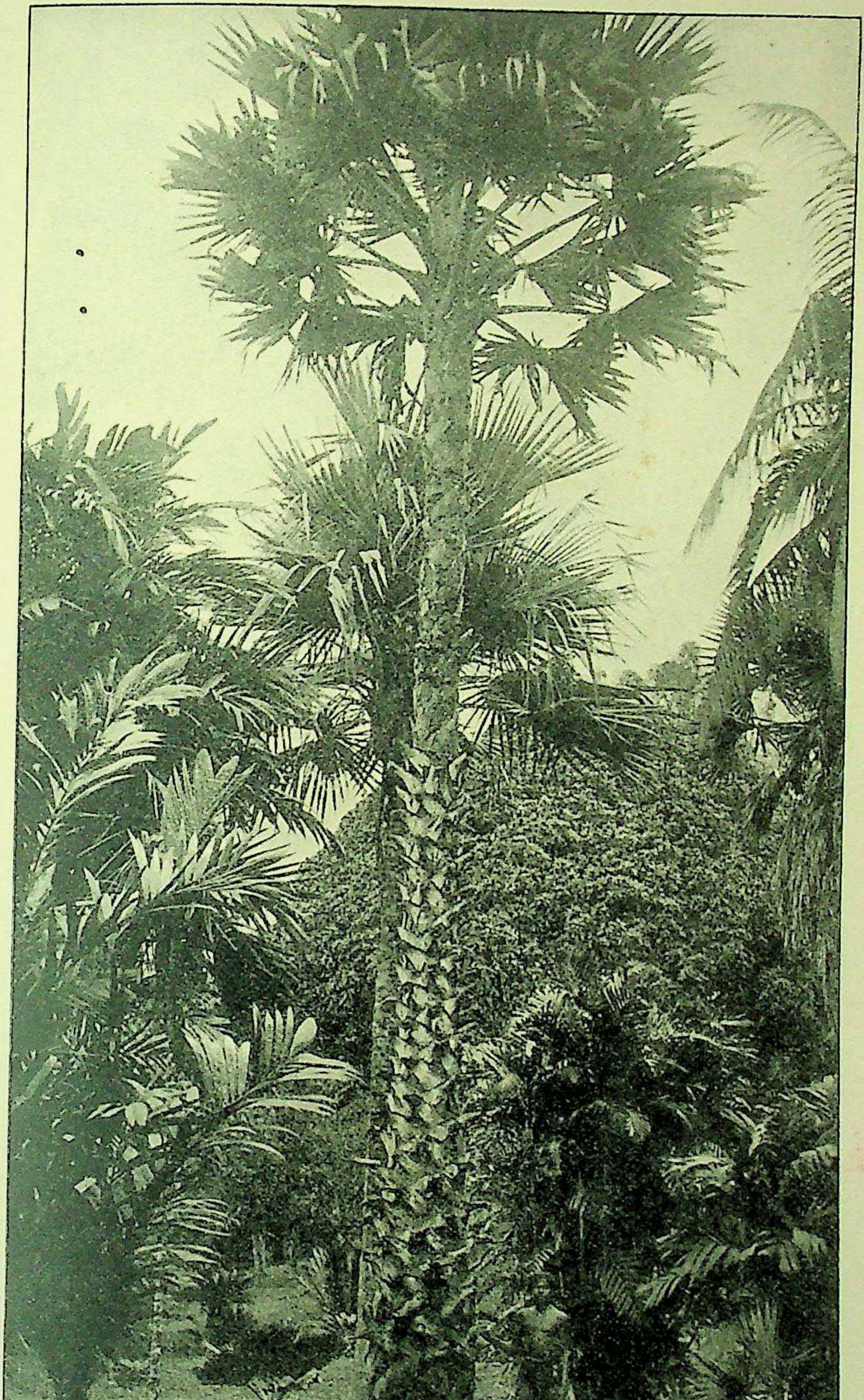
HABITAT.—Mauritius, in various parts of the island, but not abundant; Seychelles (not indigenous); Bourbon.

Cultivated in most European conservatories and in many Indian gardens.

USES.—The fruit is eaten by the Negroes, but it has a rather disagreeable flavour. The leaves are used as thatch.

ILLUSTRATION.—Plate XXXVI shows a well developed specimen of this species growing in the Royal Bot. Gardens of Peradeniya. The photograph was taken by Mr. Macmillan.

LATANIA LODDIGESII, Mart. Hist. Nat. Palm. III. 224, t. 161, fig. II, 10-14; Baker Fl. Maurit. and Seych. 381.—*L. glaucophylla*, Hort.—



LODDIGES' LATANIA (*Latania Loddigesii*, Mart).

Cleophora dendriformis, Loddiges in Cat. plant. hort. proprii in Hackney prope Lond.

NAME.—Loddiges' Latania.

DESCRIPTION.—Trunk 50 feet high. Petiole 3-$4\frac{1}{2}$ feet long, tomentose, the margins entire in the mature, spiny in the young plant; blade 3-5 feet long, very glaucous; the primary veins beneath slightly tomentose, and tinged with red, especially in young plants; segments 2 feet long, not quite 3 inches broad, unequally acuminate, the edges spiny in young plants.

Male spadix $5\frac{1}{2}$ feet long, with 8-12 branches; spikes 1-08 inches long, $\frac{3}{8}$—$\frac{7}{12}$ inch broad, arising in clusters of 3-9 from the end of the branches on a level with the mouth of the spathe. Perianth $\frac{3}{8}$ inch long; segments not fringed; stamens 16-20, or more; pistillode of 3-5 grooved filaments nearly as long as the stamens. Female spadix $3\frac{1}{2}$-4 feet long, with 5-6 branches, each bearing 1 or 2 spikes.

Fruit a drupe, obovoid or pyriform, trigonous, $2\frac{1}{2}$ inches long, $1\frac{3}{4}$ inch broad; pyrenes elongate-obovoid, faintly mucronate at the apex, $1\frac{3}{4}$-$2\frac{1}{4}$ inches long, $\frac{3}{4}$-$\frac{5}{6}$ inch broad, with a central ridge along the convex face with tree-like branching in the upper third, the inner surface furnished with a central crest, usually for only a part of its length. Seed with a dark brown testa.

HABITAT.—Mauritius, on Round Island, Flat Island, and Coin de Mire; introduced on the main land.

ILLUSTRATION.—We reproduce on plate XXXVII a photograph of *Latania Loddigesii*, taken by Mr. Macmillan in the Roy. Bot. Gardens of Peradeniya. The stem is covered, almost from the base, with the bases of fallen leaves.

LATANIA VERSCHAFFELTII, lemaire, Ill. Hort. VI, t. 229.[1]—*L. aurea*, Duncan, Cat. Hort. Maur. 52.

DESCRIPTION.—Trunk 40 feet high; petiole 5-8 feet long, densely tomentose, with entire, orange margins, spiny in young plants; blade pale green, $4\frac{1}{2}$-5 feet long; segments $2\frac{1}{2}$ feet long,

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[1] Cf. U. Dammer: Latania Verschaffeltii, Lem. Gard. Chron. ser. 3,1902, vol. 31, p 97-98.

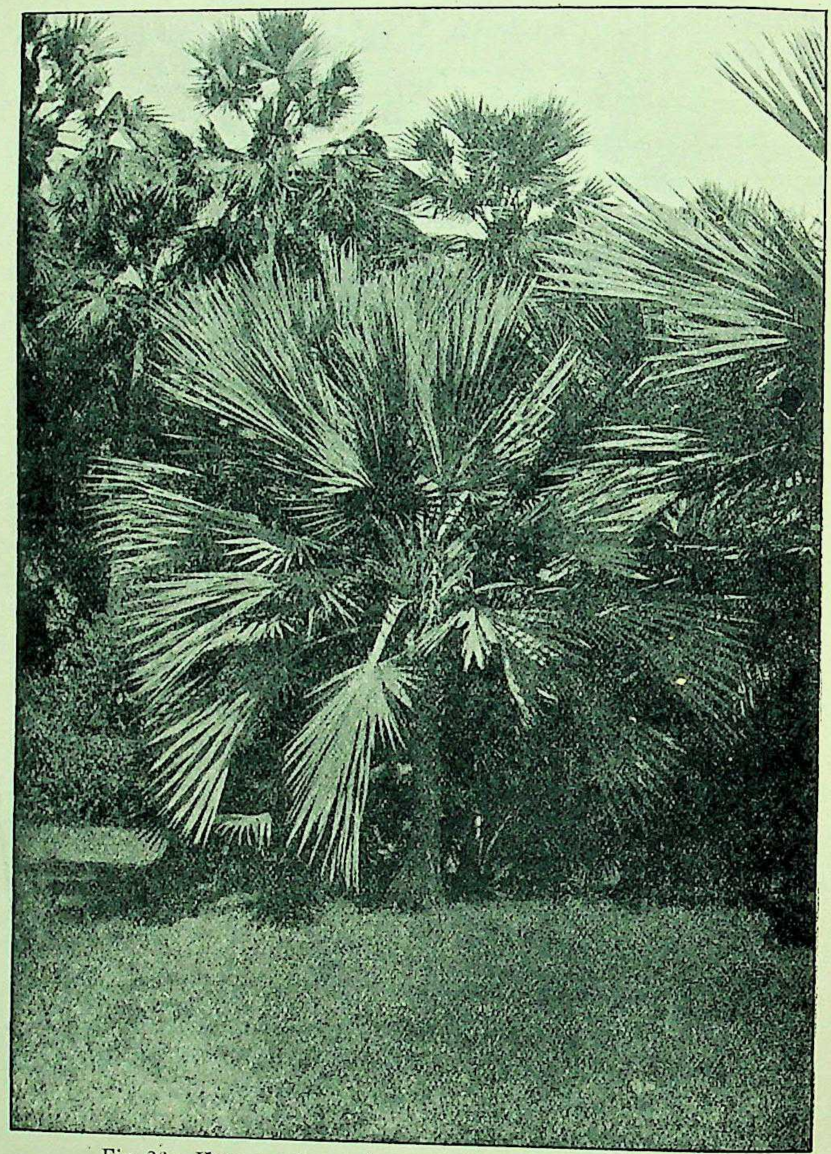

Fig. 26.—Young male specimen of *Latania Loddigesii*, Mart. From between the leaves rises the male spadix.

above 2 inches broad, acuminate, the entire margins and veins beneath slightly tomentose.

Male spadix 4-8 feet long, with 5-10 branches exceeding the spathes in length; spikes $1\frac{1}{4}$-2 feet long, $\frac{3}{8}$ inch broad, arising singly or in clusters of 2-3 on each branch; perianth $\frac{1}{12}$-$\frac{1}{4}$ inch long; stamens 20-30; pistillode a triquetrous column, shorter than the stamens. Female spadix 3-5 feet long, with 1-4 branches bearing usually solitary spikes; staminodes forming a minute cup with 6-8 teeth.

Fruit a drupe, obovoid, slightly trigonous, 2 inches long, $1\frac{1}{2}$ inch broad; pyrenes oblong, $1\frac{1}{3}$-$1\frac{3}{4}$ inch long, $\frac{5}{6}$ inch broad, the convex surface marked by many hard prominences and a median ridge continued from the base to form a prominent apical crest and thence passing a short way down the inner face and ending abruptly; on each side also a deep groove separates the apical crest from a sharp process, whence one or more ridges run downwards. Seed with a light brown testa.

HABITAT.—Rodriguez; abundant over the island.

CULTIVATION IN INDIA.—This palm is of slow growth in this climate, but bears full exposure well.

USES.—Of the beautifully marked wood walking sticks are made.

BORASSUS, Linn. Gen. Nat. 1220.

[From the Greek 'Borassus,' the cover surrounding the palm-fruit; 'Bora,' food for animals; according to Brande 'Borassus' means the skin of the date, whilst Hamilton states that it means the spathe common to most palms.]

Gaertn. Fruct. I. 21, t. 8.—Roxb. Corom. Pl. I.—71-72.—Kunth Enum. Pl. III, 221.—Mart. Hist. Nat. Palm. III, 219, t. 108, 121, 162.—Griff. Notul. III, 167.—Kurz For. Fl. II, 531.—Drude Bot. Zeitg., 1877, 635, t. 5.—Luers. Botan. II, 338.—Hook. Fl. Brit. India, VI, 481.

A very tall dioecious palm; trunk stout, unarmed. Leaves terminal, fan-shaped, plicately multifid, sides of lobes induplicate in vernation; petiole spinous; ligule short. Spadix very large, interfoliar, simply branched; peduncle sheathed with open spathes, male with stout cylindric branches, that are densely clothed with closely imbricating bracts, enclosing spikelets of flowers which hence appear as if sunk in cavities of the branch; female spadix sparingly branched, bearing few scattered solitary flowers. Male flowers biseriate in small scorpioid spikelets enclosed in the bracts, secund; perianth glumaceous; sepals and petals 3 each, imbricate; stamens 6, pistillode of 3 bristles. Female flowers larger, globose;

perianth fleshy, greatly accrescent in fruit; sepals imbricate; petals convolute; staminodes 6-9; ovary globose, entire or 3-4-cleft, 3-4-celled; stigmas 3; ovules basilar, erect. Fruit a large subglobose drupe with 1-3 obcordate compressed pyrenes; pericarp thinly fleshy; stigmas terminal. Seeds compressed, quadrate, top 3-lobed; testa adherent to the pyrene; albumen equable, hollow; embryo apical.

Species 1.

BORASSUS FLABELLIFER, L. Sp. Pl. 1187; Hook. Fl. Br. Ind. VI, 482; Trim. Fl. Ceyl. IV, 336.—B. Flabelliformis, L. Syst. Veg. ed. 13,829—Thw. Enum. 329; Roxb. Cor. Pl. I, 50, t. 71, 72; Fl. Ind. III, 790; Griff. Notul. III, 167; Mart. Hist. Nat. Palm. III, 221, t. 108, 121, 162; Kunth. Enum. III, 222.—Brand. For. Fl. 544.—Kurz. For. Fl. II. 529.—*Borassus tunicata*, Lour. Fl. Cochinch. ed. Willd., p. 760.—*B. aethiopum* Mart., l. c. 221.—*Lontarus domestica*, Rumph. Herb. Amb. I, t. 10; Ham. in Mem. Wern. Soc. V, 314; Gaertn. Fruct. I, 21, t. 8.—Rheede Hort. Malab. I, t. 9, 10.

NAMES.—Palmyra Palm, Brab Tree[1] (English); Tala, Tal, Trinaraja (Sansk.); Tal, Tar, Tarka jhar (Hind.); Tad, Tamar (Mar.); Tal, Talgachh (Beng.); Tan (Burm.); Taark Dizaar (Deccan); Tala-wruxium (Tanjore); Tal, Tal gaha (Singh.); Panay, Panay-maram [the tree], Arn Panay [the male tree], Purn-Panay [the female tree], Vadaly [the young tree], Oly [the leaf], Panang-kai [the fruit], Nonku [the kernel] (Tamil); Pootpady, Poottaly, Ponthy, Talam (Poetical Tamil); Tatechutta [the tree], Potutadu [the male tree], Pentetadu [the female tree], Bonda [the young tree], Tatikaya [the fruit], Tataku [the leaf], Nungu [the edible part of the fruit] (Tel.); Lontar (Malay); Rontal, Sualan (Java); Coli (Timor); Murume (Cochin China); Panuguera, Palmeira macha brava (Portug.); Jager-Boom, Weingeevende Palm-Boom (Dutch); Palmyra Palme (German); Rondier (French).

DESCRIPTION.—Trunk attains 100 feet in height and 2-3 feet in diameter, black, swollen above the middle and again contracted upwards, while young covered with dry leaves or the bases of petioles, old stems marked with the black narrow scars of the

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[1] The name 'Brab,' commonly used in Bombay, is derived from the Portuguese 'brava'. 'wild palm.'

petioles, near the ground with a dense masse of long rootlets. Leaves 3-5 feet in diameter, palmately fan-shaped, rigidly coriaceous, many-cleft into lanceolate or linear 2-fid lobes; segments 60-80, shining, folded along the midrib, with spinulose margins; petiole 2-4 feet long, stout, semiterete, edges with hard horny spinescent serratures; ligule short.

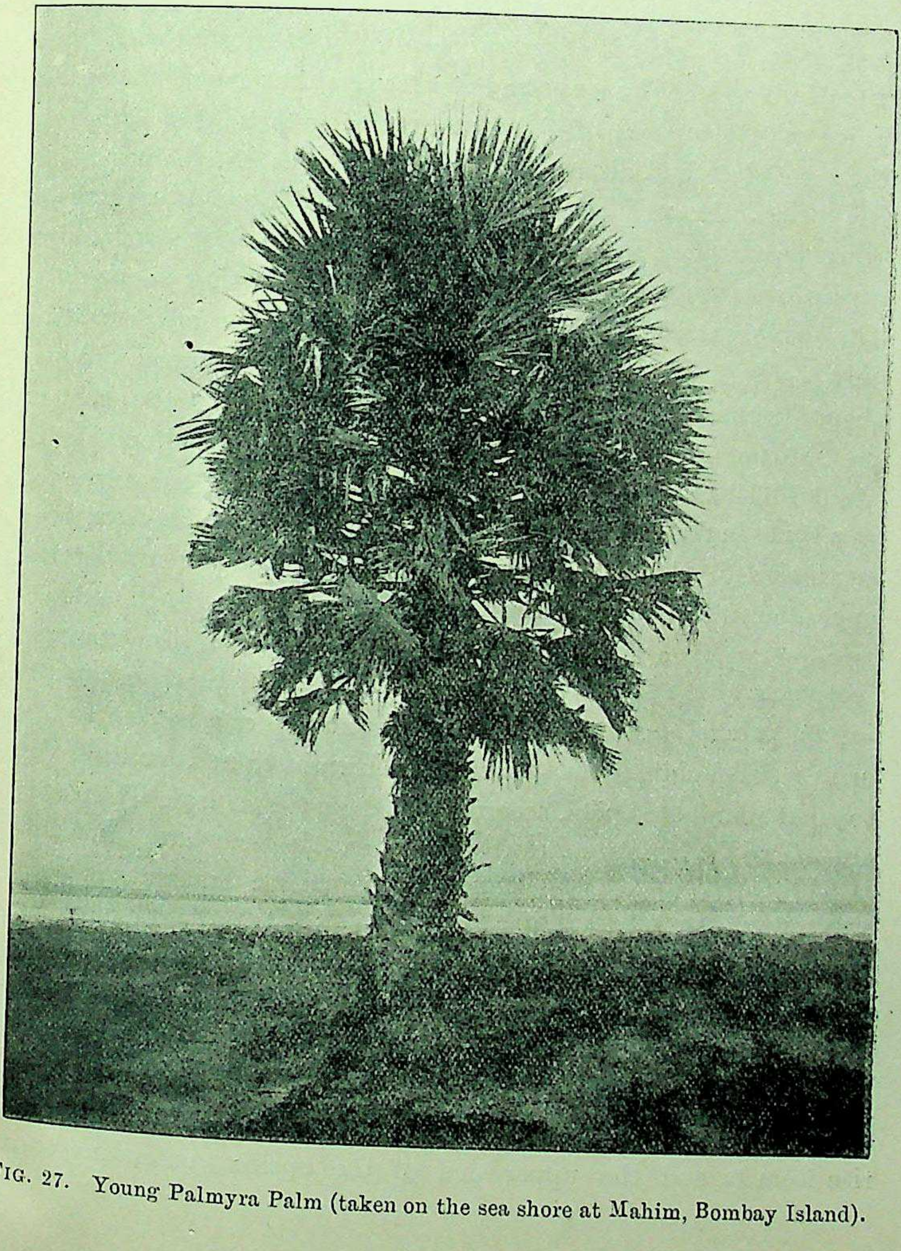
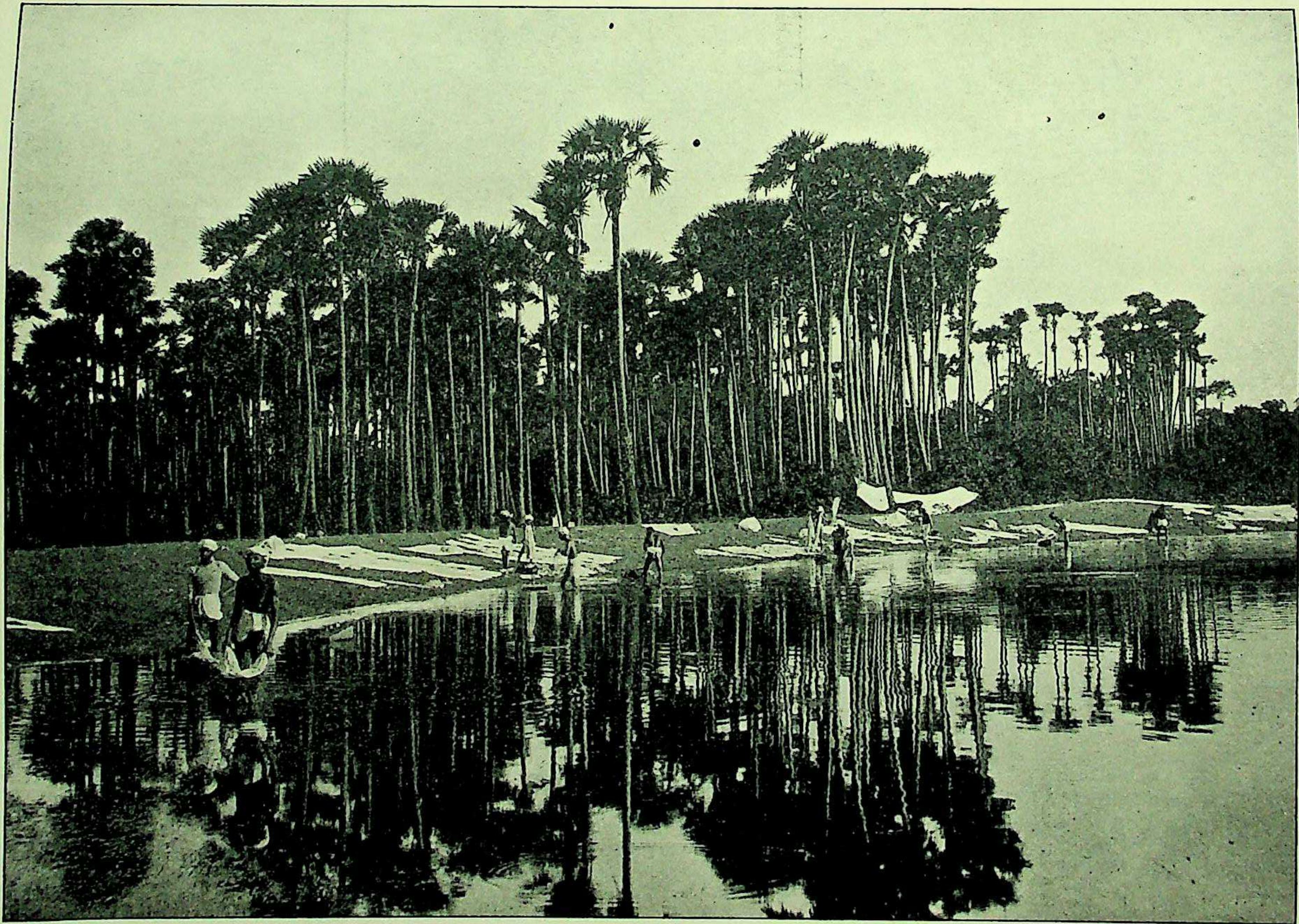


FIG. 27. Young Palmyra Palm (taken on the sea shore at Mahim, Bombay Island).

Male spadix simply branched, sheathed with many imbricated spathes, each vaginated at the base, but soon splitting into a long, concave, pointed, boat-like sheath, in substance very strong and fibrous; when young they are covered with a soft, downy, rust-coloured substance; (sometimes in the lower axil of the sheaths there is a bundle of smaller sheaths, forming a spathe like that now described, but without spadix). The superior 4 or 7 sheaths embrace each ramification of the spadix, each ramification ending in 1-3 cylindric spikes, beautifully imbricated with innumerable bracts. The lower and shorter ramifications of the spadix universally composed of 3 spikes spreading from each other in the same plane and distant from each other at the points about 3-5 inches, the middle one extending from 2-3 inches beyond the other two. One or two of the higher ramifications sometimes divided into only 2 spikes and occasionally consisting of one only. These spikes are 12-15 inches long, while the lower ones measure only 9-12 inches. The bracts of the spikes are broad, wedge-shaped, retuse, adhering by their lateral margins to the keel or back of the next above, forming a cavity for a second spikelet of about 10-12 small, sessile flowers; seldom more than one expanded at a time, beginning with the uppermost, so that there is a long succession of them. Flowers of spikelets arranged in 2 vertical opposite rows, beautifully serrated into each other, each spikelet forming an arch with its convex side undermost, the common receptacle of the little florets forming the other. Flowers appearing in parallel nearly straight rows, running from bottom to top, or in parallel oblique rows running from right to left, or from left to right round the spike, according to the position from which they are viewed. Sepals narrowly cuneate, tip truncate, inflexed. Petals shorter, obovate spathulate. Stamens 6; filaments connate with the corolla into a stalk; anthers large, subsessile, oblong.

Female spadix simple; spikes terminating the branches of the spadix; the lower end of the spadix is a smooth stem, sheathed with several spathes; spikes enveloped in bracts which cover all parts of it and rise over the flowers to the number of 8-12; a barren bract encircles the spadix, just below where the flowers commence to rise from it, and the upper end of the spadix, extending to a



A GROVE OF PALMYRA PALMS (*Borassus flabellifer*, Linn.) IN NORTHERN CEYLON.

length of 2 or 3 inches beyond the flowers, is also enveloped by these bracts. Flowers larger than the male flowers, 1 inch in diameter, globose. Sepals fleshy, reniform, imbricate; petals smaller, convolute; staminodes 6-9. Ovary subtrigonous, (3-4-celled) celled; stigmas sessile, recurved.

Fruit, a drupe, when young pretty distinctly trigonous, but when old, the pulp round the pyrenes so swells as to give the fruit the appearance of an almost perfect globe, 6-8 inches in diameter, seated on the greatly enlarged perianth. Pyrenes 3-1, obcordate, fibrous outside; endosperm horny, hollow; mesocarp fleshy and fibrous.

GERMINATION.—When the nuts begin to germinate, the space within the kernel fills up with a cream coloured substance of the consistency of cheese[1]. From this the root of the germ or young plant protrudes, through that end of the nut which was attached to the spadix, the body or actual stem of the plant following, until the two first leaflets are thrown up with the shell of the nut attached. All these parts are, when very young, beautifully incased in an entire leathery substance like the sheaths of the spadix. These seedlings are called 'dantalas' or 'kelingoos'.

Each of these little trees has 1-4 rootlets attached to it. The lower part of the stem, where those roots are attached, resembles much that end of a carrot, parsnip or radish to which the crop is attached; and indeed the plant altogether looks very like an inverted long parsnip.

These dantalas, which are found beneath the surface, are about 1 inch thick at the lower part and taper off to a mere point, being 12-15 inches long. A slit or groove runs from near the bottom to the top. This groove is nothing else but the folding inwards of the first leaf, which composes nearly the entire thickness of the stem. If it be cut across, it will be found to enclose the inner leaves in a small oval pipe about ⅛ inch in thickness.

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[1] For the chemical aspect of the process of germination, see: Gatin, C. L., Contribution à l'étude chimique de la germination du Borassus flabelliformis L., in Bull. Soc. Bot. de France (1905), 4th series, vol. v., pp. 558-561.

By the same author: Nouvelle contribution à l'étude chimique de la germination du Borassus flabelliformis, L. in Rev. Gén. Bot. Paris, 18 (1906), 481-483.

Besides: Recherches anatomiques et chimiques sur la germination des palmiers. Paris, 1906, pp 307-308.

Transformation diastasique du mannose en glucose au cours de la germination du Borassus flabelliformis, L., in Bull. Soc. Bot. de France, vol. 55 (1908), pp. 383-386.

When these dantalas are about 9 to 12 months old, they have usually two leaves just issuing from the surface. These are from 1-1½ inches in breadth, and from 2½-3 feet in length, having only four or five folds in each leaf. When the leaves issue from the ground, no part of the stem is seen, but a succession of leaves goes on, increasing in breadth and thickness, for 6 to 7 years. The stem close to the ground is then perhaps as stout as ever it will be; indeed in many cases stouter, as these trees harden and compress by age. (Ferguson.)

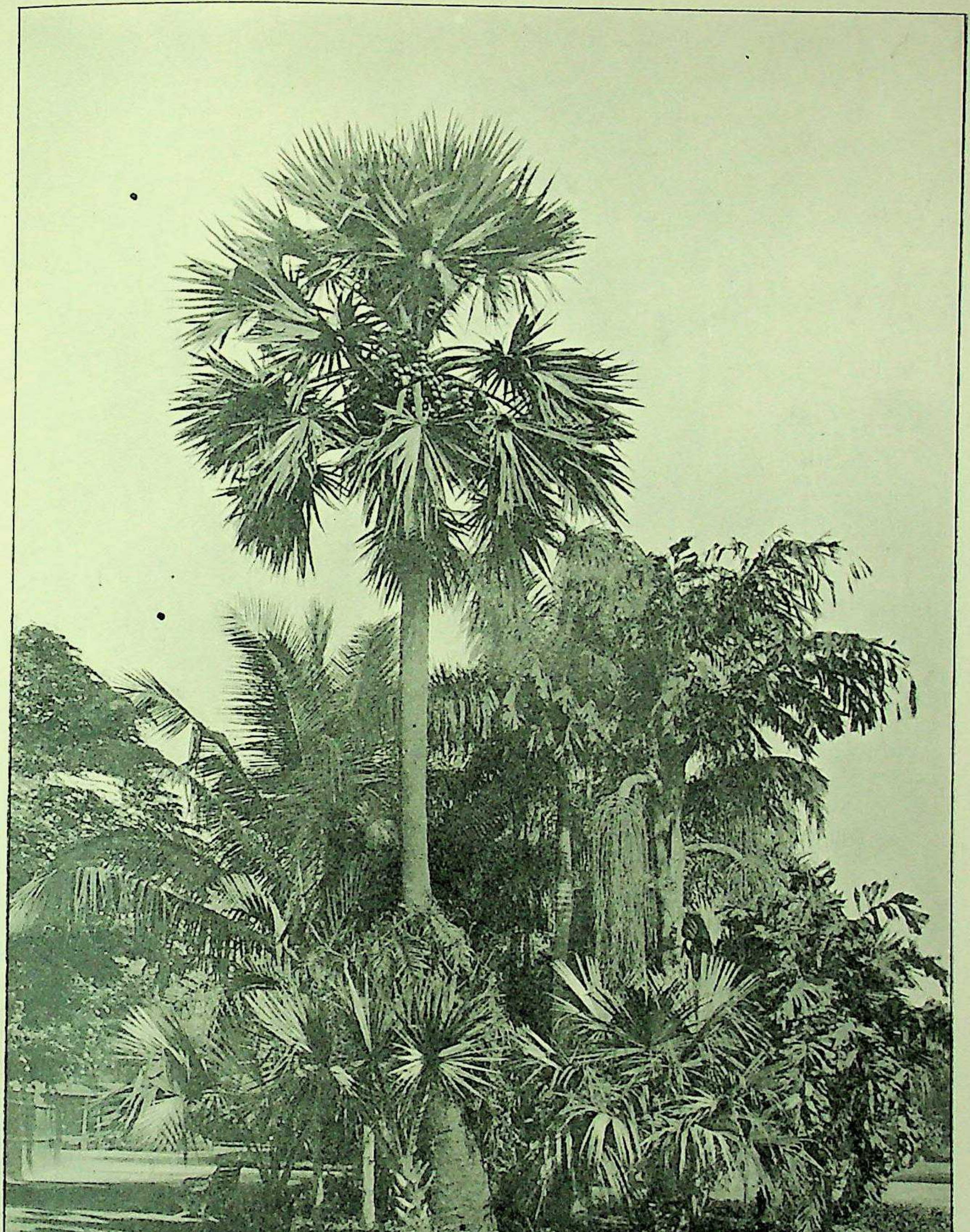
GROWTH OF PALMYRAS.—On this subject we refer to:

Jackson, A. B.—The rate of growth of Palmyras, Indian Forester, Vol. 35, p. 394.

Lushington, A. W.—The growth of Palmyras. Ibid., Vol. 35, p. 573, Vol. 36, p. 362.

Hole, R. S.—The growth of Palmyras. Ibid., Vol. 35, p. 632.

HABITAT.—A native of tropical Africa. Cultivated in the Indian Archipelago, the Trans-Gangetic Peninsula, Ceylon, South and Central India, Bengal and Lower Sind. In North-West India as far north as Aligarh and Shahjehanpur. Isolated trees in gardens in Rohilkhand and the Upper Ganges, Doab, as far as Saharanpur. Also on both sides of the Persian Gulf, attaining there about the same latitude as in North-West India, *i.e.*, 30° N. L. Immense groves of it are found on the Malabar coast, extending from Cape Comorin through Travancore, Calicut, Goa, and the Bombay Presidency, on through Gujarat and up some distance on the banks of the Indus. But what are emphatically called the Palmyra regions may be included in a line extending along the Coromandel coast from Cape Comorin to Madras including the northern portion of Ceylon and from Madras all along, taking in a considerable belt of the coast between that and Point Palmyras, and then passing up to Gya on the 85th degree of E. L. and nearly 25° of N. L. After that the line should be carried on about due east until it reaches Ava, below which on the banks of the



PALMYRA PALM (*Borassus flabellifer*, Linn.) IN FRUIT.

Irrawaddy, there are immense groves of this Palm. From Ava the line should pass down south-east, through the Malayan Peninsula and the Indian Archipelago, including Sumatra, Borneo, Celebes, Flores, and the Molucca Isles.

The Palmyra Palm is found in various parts of the mountain district of Ceylon, including the vicinity of Kandy and of Badulla at elevations of 1,680 and 2,450 feet respectively, having a mean annual temperature of about 74° at the former and 71½° at the latter.

Although immense groves are found on the banks of the Irrawaddy, from the sea coast up to nearly as far as Ava or Amarapura in Burma, and as far inland as Gya in Bengal, and in isolated patches all round and through Ceylon, still the most congenial places for their favourable development will be found in low sandy plains scarcely elevated above the level of the sea, and where they are exposed to the burning sun, and the force of at least one of the monsoons. Such are Jaffna, with the surrounding islands, and other portions of the northern province of Ceylon, the district of Tinnevelly, with portions of the Madura Collectorate, portions of the Madras and Bombay Presidencies and of the Indian Archipelago.[1]

FLOWERS.—In March and April; fruit ripens in April and May and is matured in July and August.

THE PALMYRA PALM AND ITS GUESTS.—The tree is well adapted for sheltering animals and hence they are resorted to by birds at night, and by rats, squirrels, mungooses, monkeys, etc., during the day time. When the leaves of a tree are undisturbed, the number of bats sometimes occupying it is incredibly great.

A great number of epiphytical plants find support and nourishment in the axils of the leaves. A very interesting union is that formed by the Palmyra and several species of Ficus. The birds which feed upon the fruit of Fig trees "drop the seeds in the alæ (axils) of the leaves, where they grow and extend their roots, etc., so as in time to embrace the parent Palmyra, except its upper parts. In very old ones the top thereof is just seen issuing from the trunk of the Banyan, as if it grew from thence, whereas it runs down through its centre, and has its roots in the ground, the palm being the older. For such the Hindoos entertain a religious veneration saying it is a holy marriage instituted by Providence." (Roxburgh.)

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[1] Ferguson, W., Description of the Palmyra Palm of Ceylon. Colombo 1888, p. 11.

USES.—Every part of the Palmyra Palm is turned to account in some way or other.[1] By far the most important aspect of this tree is as a source of food.

1. *The juice or toddy.*—This is almost as famous for its use as notorious for its abuse. The juice can only be obtained after the young flowering branches have made their first appearance. The trees do not generally bear until 12 to 15 years after they have been planted, and only then can the male be distinguished from the female trees. Ferguson, who examined trees of both sexes most minutely before the spadices were to be seen, could detect no peculiarity in shape, size or colour by which to distinguish them. Were it possible to do so, it would be of the utmost importance to extensive cultivators of this useful palm. When the trees have arrived at the age mentioned, the spathes begin, in the months of November and December, to protrude from amongst the leaves near the top of the trees, which have then attained heights varying from 8-25 feet. The next natural course would be the bursting of these spathes, and the production of fruits, but in many cases the laws of nature are herein completely thwarted, for the toddy drawers now step forward and attack the trees of both sexes, but oftener the males, for the extraction of toddy,—the life juice of the inflorescence. In the various written descriptions of the ways in which this is done, the information is often contradictory and unsatisfactory. Some writers, and recent ones too, state that the fruits of the trees are pierced for the purpose. Others say, that a hole is bored in the body of the tree in which a plug is inserted, to be removed when toddy is wanted. In this conflict of opinions we consider it much safer to follow an experienced guide.

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[1] Grisard, J., Produits et utilisation du Rondier, in Rev. Cult. Colon. Paris, 9 (1901), 110-114.

Ferguson gives an excellent description of the whole process from personal observations made in Ceylon.

When the proper season arrives, which is in November and December, the too frequently degraded and drunken toddy-drawers are seen and heard busy at work in the Palmyra groves throughout the Peninsula of Jaffna. Their practised eyes soon fix on those trees that are fit for the 'scalping knife', and if they have not dropped the footstalks of the leaves, the first operation, if the trees are valuable, is to wrench these off. This done the toddy-drawer, armed with his leathern protector for his breast, his raceme-batten of wood, his small thongs, straight and crooked knives, with the 'side leather pouch' to contain them, procures a piece of tough jungle vine, or a strip of the footstalk of a fresh leaf of a young Palmyra or Cocoanut tree, which he thoroughly twists, and then converts it into a sort of loop of such dimensions as to admit of his feet getting through to a span large enough to allow them clasp the tree. This done he puts his feet in this thong, stands close to the tree, stretches himself at full length, clasps it with his hands, and pulls his feet up as close to his arms as possible; again he slides up his hands, and the same process is repeated, until, by a species of screw process, he ascends to the summit of the tree. When the trees are high, some use hoops of the same material, large enough to encircle both the tree and the toddy-drawer who slides it up the tree, so that it is always a support to the body while the climber is in the act of taking a fresh grasp.

Arrived at the summit, amongst the leaves, the climbing apparatus is laid across a leafstalk, and the pruning and phlebotomy commence. One or two of the lower leaves are left as a support to the toddy-drawer until the operation is completed. He then draws his crooked knife, which, on a small scale, a good deal resembles a reaping hook, and rids the tree of all the accumulated dirt, such as old leaves, the net work which supports them, and, if an old tree that bore fruit before, the stumps of the fruitstalks. Then all the leaves are cut off, excepting 3 or 4, and the young top bud of the tree. Besides the removal of all these, the crooked knife is now used in shearing off the outer covering of that part of the tree from which spring the leaves and the racemes. These latter are supported during this operation, by being tied up by several thongs to the footstalks of the uncut leaves. The pruning having been completed, all or most of the spathes are effectually encompassed from end to end by thongs, to prevent the membrane which covers the inflorescence from bursting. The racemes thus tied are then beaten and crushed between the wooden battens to wound them, and to hurry on the flow of toddy. This done and the spathes being secured to stalks of the remaining leaves, the toddy-drawer descends. The operation of beating and crushing takes place for 3 successive mornings, and on each of the 4 following a thin slice is cut from the points of the racemes, to encourage the flow of sap and keep them from bursting. On the eighth morning a clear sweet liquor begins to flow from the wounded spadix, which is indicated by the 'Toddy Birds' and crows fighting and chattering amongst the trees. The toddy-drawer then ascends with a chatty or toddy-receiver stuck to his belt behind. He places the ends of the spadix in these, and when secured leaves them till evening, when they are found to contain quantities of this liquor. The operation of attracting the juice is repeated every morning and evening, or in the mornings only, until the whole of the spadix is sliced away.

The trees are drained in this way for several months of the year, but if the operation is repeated on the same tree for 3 successive years, without allowing any of the buds to burst naturally, the trees are said to die. A spadix continues to give toddy for about 5 months, at the rate of 3 or 4 quarts a day, and while seldom three spadices are yielding toddy on the Cocoanut tree, seven or eight will yield juice at once on the Palmyra Palm. An expert climber can draw the toddy from about 40 trees in a few hours.

In Jaffna a distinction is made between 'toddy' and 'sweet toddy'. The former, called by the Tamils Culloo, is the juice when it is allowed to ferment, which it does in a few hours after sunrise. Sweet toddy, called Carupaner, is obtained by sprinkling the inside of the toddy-receiver with lime or chunam, which keeps it from fermenting.

The toddy procured from the male Palmyra tree is said to be sweeter than that from the female. The latter, besides, yields only about half as much sap as the male.

Many trees are encircled near the ground with a strip of tar, etc., to prevent ants and other vermin getting up and making a decoction of the toddy in the chatties.

It is not a little amusing to notice the various comparisons to which this juice has given rise. Sir W. Jones compares it, fresh from the tree, to Poubon water, fresh from the fountain, or to the best mild champagne; Malcolm, the American, naturally enough associates its taste with that of his native cider; while Johnson, a traveller in Abyssinia, ranks it no higher than ginger beer. It is possible it bears a resemblance to all these, and indeed a good deal of the Ceylon ginger beer is made from toddy. The result of partaking of toddy in the early morning is generally a listless drowsy sensation.

2. *Sugar or Jaggery*[1].—It appears, says Ferguson, that in the time of Menu, upwards of 4,000 years ago, the Hindus knew how to make sugar from the flowers of the Madhuca tree (*Bassia latifolia*); and this being the case, there is great reason to suppose that sugar was made from some of the palm-trees at a much earlier period. Sugar candy is alluded to by Megasthenes under the name of 'Indian stone,' and to this day the crystals formed either from jaggery or the juice of the cane are called 'Catcandu, or stone sugar. The common Indian name for the finer sorts of sugar, 'Cheenee' has been supposed to point to the Chinese origin of the production.

The usual process of making jaggery, as persued at Jaffna, is exceedingly simple. The sweet toddy is boiled until it becomes a thick syrup; a small quantity of scraped cocoanut kernel is thrown in that it may be ascertained by the feel if the syrup has reached the proper consistency and then it is poured into small baskets of Palmyra leaf where it cools and hardens into jaggery. In these small plaited Palmyra baskets it is kept for home consumption.

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[1] These terms are variously derived from the Sanskrit 'Sakar,' Arabic Shakar whence the Latin 'Saccharum', and the English 'Sugar.'

sent coastwise, chiefly to Colombo, or exported beyond seas to be refined. About 3 quarts of toddy suffice for boiling into 1 lb. of jaggery. The juice of the Palmyra is richer in saccharine matter than that of most other palms, in consequence, perhaps, of the tree more generally growing in dry sandy soil and in a dry climate.

To make 'Vellum' or crystallized jaggery, which is extensively used as a medicine, the process is nearly the same as for the common substance; only the syrup is not boiled for so long a period. The pot which contains it is covered and put aside for some months, at the end of which period the crystals are found in abundance.

Jaggery, besides being exported in large quantities, forms a considerable portion of the food of the poorer classes in India and Ceylon. The sweetness of Burmese bread seems to depend on the use of toddy-juice to raise it.

Amongst a variety of purposes to which it is put, is that of being mixed, together with whites of eggs, with lime from burnt coral or shells. The result is a tenacious mortar, capable of receiving so beautiful a polish that it can with difficulty be distinguished from the finest white marble.

It is stated that palm sugar, which is chiefly the produce of the Palmyra tree is more granulated and higher priced than that obtained from the cane. Small round cakes of jaggery were used formerly and to some extent still pass as currency in the Tinnevelly district.

3. Vinegar.—Large quantities of vinegar are made in Ceylon from toddy. It is prepared in the following way:—A glazed earthen jar is buried three-fourths its depth in the earth, in a spot exposed to the full influence of the sun. A quantity of Palmyra or Cocoanut tree toddy is daily thrown into the jar, until it is nearly full, when the mouth of it is carefully clayed up. The fermenting process immediately commences and continues for some months. At a certain stage of the process, which is ascertained by removing the cover and testing the quality of the vinegar, quantity of burnt paddy is thrown in, which in the course of a few days change the watery colour of the fluid to that of pale brandy. The vinegar is then fit to be bottled. It is used extensively for pickling gherkins, limes, the cabbage from the heart of the Cocoanut and Palmyra trees, and several other substances.[1]

The following particulars regarding the preparation of vinegar apply to the Madras Presidency[2]: The producers are the toddy-shopkeepers, and they convert their unspent toddy into vinegar in either of the following ways. The toddy is placed in a clothed earthen pot and kept there till fermentation is complete and the liquid has become sour. The pot is either kept above ground for a month or two, or is buried underground for three or 4 months or more, and then taken out. The longer the pot is kept closed and underground, the better the quality of the vinegar. In either case pure vinegar is obtained when the pot is opened and the sediment has been removed. Vinegar is also made by heating fermented toddy either by fire or by exposure to the sun. It is procured in a shorter time by this method, but the quantity is less than by the slow or natural fermentation. The vinegar thus obtained is, however, used both for medicinal purposes and in cooking. There is no shop or bazar in Madras where country-made vinegar is specially sold, and the trade is not so extensive as that in either English or German vinegar.

4. Palm Wine or Arak.—If the toddy be distilled the result is palm wine (arak). "The extent to which the spirituous liquor is employed," says Watt, "may be judged from the fact that at one time the Bombay Government became so alarmed at the excessive consumption of arak in Surat that they ordered large numbers of this useful palm to be destroyed. In this connection it is interesting to observe that Fryer, who visited Surat in 1673, mentions that on drawing near the roadstead they saw groves of Brab-trees, from which the Parsis made a 'wine akin to toddy.' This wine the sailors drank, and the result was perpetual disturbances of the peace. The plentifulness of the toddy resulted in the district being overrun by 'soldiers and seamen of the Moors.'"

5. The Fruit.—Within the shell of the young fruit there is a jelly-like fluid which is eventually transformed and deposited as a hard albumen. When the fruit is half-ripe (April-May), while the shell is yet soft, they are often torn off or cut from the tree, and stripped of the outer bark. The shell of it is then perforated with the finger, and then the soft kernel can be sucked up. It is pleasant to the taste and exceedingly refreshing; but too large a quantity of it ought not to be taken, for, according to Rumphius, it debilitates the stomach. The jelly and soft albuminous layers are sometimes cut into pieces and flavoured with sugar and rosewater.

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[1] Ferguson W. l. c. p. 29.

[2] Watt, G. The commercial products of India. London, 1908, p. 1111

The fruits, when ripe, vary in colour from a light gold at the end which is attached to the spadix, to brown and nearly black at the other. Some trees have all their fruits of a beautiful gold and others of a very dark colour, and these differences in their colour and other properties have induced the natives to give them various names. The fruits, when they fall ripe from the tree, are sometimes eaten raw, but are more generally roasted, and the scene exhibited at a roasting feast of Palmyra fruits, is in Ferguson's estimation one of the most purely Oriental that can be witnessed. "When at hand, the shade of an Illipe (*Bassia longifolia*), of a Margosa (*Melia Azadirachta*), or Tamarind (*Tamarindus indica*) is chosen; a fire is lighted on the ground, composed of Palmyra leaves, etc., and the party, men, women, boys and girls, squat around, sucking the pulp out of the fibres of each fruit as it is roasted, tearing them asunder with nails and teeth in the most approved and natural style, all appearing wrapped in the highest possible state of alimentive enjoyment."

The mesocarp of the ripe fruit is a soft, mellow, luscious, semi-saccharine and farinaceous matter, known as Palmyra pulp. The period during which the fruits are obtained being short and a greater number ripening than the inhabitants can consume, preserved pulp (called punatoo in Ceylon) is made in the following manner:— "Pandals (stages) are constructed within 4 or 5 feet of the ground, and on these Palmyra-leaf mats are spread; the ripe fruits are then taken, torn up, put into ola-baskets containing fresh water, and are there squeezed by the hands till the pulp with the water forms a jelly. Layers of this jelly are spread on the mats to dry; this process is repeated for 15 to 18 days, one layer being deposited above the other until they amount to about 15 or attain to about half an inch in thickness. The mats are exposed in the sun to dry, being covered at night and protected from the rains and dews." The tough leathery kind of preserved pulp made from the remaining fruits gathered at the end of the season, is much inferior to the other, and is called Tot Punatoo. The pulp is preserved in ola-baskets or bags by being hung up in the smoke. It is generally eaten plain or mixed with gruel made from the pounded farina of the young Palmyra seedlings and with cocoanut kernel.

Rumphius'[1] graphic account of the way in which Punatoo is prepared, is well worth being quoted in this place: "In making 'Punata' more labour is required, for after the ripe fruits, which fall from the tree from July to September, have been collected, the stalks and the cups are twisted off with the hands; the outer rind is stripped off, and the peeled fruit are washed in water, and cleansed from the adhering fibres and earth; they are then pressed out, and rubbed for a long time with other limpid water, until all the yellow juice has been drawn out; this is sometimes repeated twice or thrice, lest the juice should be lost; and it assumes a thick consistency; and with a hooked stick they cleanse it from all the fibres of the shell; and then they prepare a machine made of sticks, which is here called Parra Parra, by the Malays Lante Lante, and in Malabar Pandel. On this machine they spread large palm mats from 14 to 16 cubits long, on which they then pour out the liquor so thick, that scarcely a leaf of the mat can be seen; they then leave it to dry for one day and on the next day they pour fresh juice, which is again left to dry, after repeating the same labour until this cake has acquired the thickness of three fingers; which labour is generally continued for 15 or 16 days; but these mats are folded up during night, and are covered with leaves to preserve it from cats and dogs, who are exceedingly fond of this cake. When this becomes as hard as cheese, it is cut into square pieces or cakes, and they raise them gently from the mats with a knife and place them in layers in baskets, and sprinkle the layers with water in which salt has been dissolved.

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[1] Rumphius, G. E., Herbarium amboinense. Amstelod. 1741-1755, Vol. I, Cap. IX.

"And these baskets or sacks are placed on a three-legged stool, which they fasten by a rope to a beam, that for some days they may be impregnated with smoke; but this should not be done too much, lest the Punata should become bitter; they also place the ropes in such a manner, that mice cannot enter; and then this work is finished, and the Punata or Pœnata so often mentioned is prepared—and this they reserve for use during winter.

"The people of Maccassar prepare the fruit in a much more convenient manner, nor do they spend so much labour. When the juice has been only expressed, they pour it into large pans and mix it with the farina of rice, and thence prepare many kinds of food."

The seed within the albumen is also eaten, being sold in Bengal under the name 'talsans.'

6. *Young seedlings (dantalas, kelingoos) as vegetable.*—After the Punatoo, described above, is taken from the ripe fruits, the nuts are kept for future use. At a convenient season they are sown in 6 to 8 layers, under loose, sandy soil, thrown up in parts of the gardens or fields close to the dwellings of the natives. Planted in beds in this manner, there is, no doubt, a greater heat created in consequence of the fibre surrounding the nuts, &c., which induces them to grow more rapidly than otherwise and better for purposes of food. According to the 'Agricultural Ledger' about 50 fruits are planted to the square yard, and these may produce 100 and more dantalas.

These are taken up when they are two or three months old, the nuts cut from the points of the leaves, and then the seedlings are exported or eaten in various ways. "To keep these kelingoos for future use, they are deprived of the beautiful parchment-like sheath in which they are completely enveloped, and then dried in the sun. Those dried in this manner, before they are boiled, are emphatically called Odials, and those boiled after, are called Poolooc Odials. It is the Odials that are reduced to flour or meal of which the favourite Cool (of the Singhalese), or gruel is made. The kelingoos roasted, boiled, or cut into slips and fried like slices of Bread Fruit, are eaten by the natives and will be found in the bazaars of Colombo and elsewhere all the year round. In their dried state they seem to be chiefly farina with a few fibres running through them, and their taste is very astringent. It is of the

Odials that the flour once so prized by the Dutch, according to Bennet, is made; though in these days [1850] we never hear of this substance being sent to the Cape of Good Hope or Holland. A substance called Putoo is made of the Kelingoo flour. To the meal is added a little water, into this are put prawns or small fish, scrapings of Cocoanut kernel, unripe jack fruit, etc. This mixture is put into an ola-basket which is placed on the top of a pot of boiling water, covered over with a chatty, and cooked by the steam. This is reckoned a great delicacy." (Ferguson).

In India the vegetable is eaten chiefly by Kolis and low-class people.

In a cheap year the gross value of a crop per acre at ordinary market rates would be about Rs. 1,800, rising in a dearer season to Rs. 3,000.

7. *Medicine.*—The juice of this plant is used as a stimulant and anti-phlegmatic. "Europeans, especially delicate females, in India, who are apt to suffer much from constipation, find a cup-full of this toddy, drank every morning at five o'clock, one of the simplest and best remedies they can employ. The Vytians prescribe it in consumptive cases." (Ainslie, Materia Medica.)

The root is considered cooling and restorative, as also the gelatinous contents of the unripe seeds. The ash of the spathe is given for enlarged spleen.

A useful stimulant application, called toddy-poultice, is prepared by adding fresh drawn toddy to rice-flour till it has the consistence of a soft poultice; and this being subjected to a gentle fire, fermentation takes place. This, spread on a cloth and applied to the parts, acts as a valuable application to gangrenous ulcerations, carbuncles, and indolent ulcers. The light-brown cotton-like substance from the outside of the base of the leaves is employed as a styptic for arresting hæmorrhage from superficial wounds. (Pharmacop. of India).

8. *Wood.*—The trees have to arrive at a considerable age before they are of use for timber; when a hundred years old, they are excellent. The heart of the tree is soft, but the outer wood is hard, heavy, and durable, consisting of numerous thick black vascular bundles. The weight of the solid foot is 65 lb., the value

of P. 944. Pillars and posts for the verandahs of the houses, well-sweeps, etc., are made of this timber. Trunks split into halves, with the heart scooped out, are used as spouts for various purposes, but more especially for carrying away the water from the eaves of houses. The thick parts of the trunks are generally taken for rafters, the thinner or tops for laths. The trunks of young trees or the tops of old ones are often cut into pieces and placed where game is plentiful, as in the Patchelepalla district of Jaffna. The wild hogs and hares are very fond of the soft, white, spongy hearts of the logs, and in resorting to them to eat, are frequently shot by the natives. The dark outside wood of very old trees is used to some extent in Europe for umbrella-handles, walking canes, paper rulers, fancy boxes, wager-stamps, and other articles. It is well known in India that the female tree produces the best and hardest timber, and that that of the male is considered so inferior that, unless the trees are very old, it is never used. The juice is used in the preparation of cements.

9. Leaves and Fibres.—When the leaves are intended for thatch of houses, and for making fences for gardens and fields, they are laid flat on the ground in layers over each other and often with weights upon them to assist in flattening them. The thatch formed of these does not last so long nor is it so handsome as that made from the plaited cocoanut leaves. Palmyra thatch, when laid on well, lasts for two years, but being so plentiful and cheap, the leaves are generally renewed yearly.

In India as well as in Ceylon the leaves are extensively used for manuring the rice fields. The fan parts are put into the ground till they rot off; this is found to be an excellent manure, giving a quantity of silicious and other matter to the soil.

Mats of various sizes, used instead of carpets on floors, for ceiling and for many other purposes, are made of the Palmyra leaves. Ola bags are also formed and are useful for purposes where strength of texture is not an object. Even water baskets for raising water are made of the leaves. They are circular on the top but taper down in a triangular form to the bottom which is a point. They are occasionally woven into hats and caps. At Diamond

Harbour near Culcutta, hats have for many years been made of this material and sold to the European sailors who visit Calcutta.

Umbrellas made of these leaves, though doubtless very good for protection from sun and rain, are rather inconvenient, as they are made in such a way that they cannot be folded. They have a handle and are about the size of an ordinary umbrella when expanded. Single leaves are occasionally used as a protection from the sun when the weather is very hot.

A great variety of fans are made of the leaves; some are nicely painted and covered with pieces of transparent and colourless talc, others are made to fold into a small compass, and again to expand, when wanted, into an almost perfect circle.

Several kinds of fibre may be obtained from the Palmyra Palm. A loose fibre which surrounds the base of the leaf-stalk; a fibre which may be separated from the leaf-stalks; a fibre called tar, which may be prepared from the interior of the stem; a fibre or coir derived from the pericarp, and the fibrous material of the leaves.

The leaf-fibre is utilised in the manufacture of the basket-ware of Madras, produced at Pulikat in Chingleput, Kimedi in Ganjam and Bezwada in Godavari, etc. Fine strips of the leaves specially prepared and dyed are plaited into braids and worked up into fancy boxes, cigar-cases and the like.

Some years back investigations were instituted in India with a view to determining the extent to which the cord-like fibres might be employed in brush-making, as substitutes for the American piassaba fibre (*Attalea funifera*) and the Ceylon kittul (*Caryota urens*). So far indications have not been obtained of a very great demand for these special Indian fibres.

The stem or tar fibre is prepared in some special way by the fishermen so that it becomes pliable and can be plaited into fish-traps. It is neither spun nor twisted, a single thread or fibro-vascular bundle being used. The method of preparation adopted by the fishermen has not as yet been made public. The export trade in tal coir, or 'palm-fibre,' as it is often called, centres largely in Tuticorin.

One of the most singular purposes to which the Palmyra leaf is employed in Ceylon is that of being used as a plug to keep open and enlarge the holes bored in the lobes of men's ears and in which are ultimately inserted those huge golden rings and masses of jewellery, which the wealthy among the Tamils are so fond of displaying. For this purpose a thin leaflet is neatly cut into a narrow stripe and closely rolled up. In this state its tendency to expand assists materially in keeping the hole open.[1]

The following passage, taken from Rumphius who wrote in 1741, is more of historical interest: "By the inhabitants of Macassar," he says, "these leaves are so much esteemed, that none of the common people dare carry an umbrella or large broad-brimmed hat made of them, except the three highest noblemen in that country, namely, the Princes of Tello, of Goa, and of Sadrabona. They accordingly make umbrellas from the leaf of the Talla (Palmyra), all the radii of which are interwoven with tinsel, and surrounded with a border of ebony, or even covered with Rottanga and silk, so that this broad-brimmed hat or umbrella is always open. If they wish to carry it, they place it on a stick, the handle of which is covered with gold, and which it is not proper for their servants to carry without distinction behind the back; this is permitted only to the nobles." (*Herbarium amboinense.*)

10. Leaves as writing material.—The most singular purposes to which they are devoted is that of writing upon. A well-informed Tamil Native furnished Ferguson with the following information: "The oldest Hindoo author who mentions writing on Olas (Palmyra leaves) is Panniny-rishee who lived about the year 790 of the Caliyugam; that is 4161 years[2] ago, according to Hindoo reckoning. He resided near the source of the River Ganges at a place called Arrittuwarum. He was the inventor of the Sanscrit Alphabet, although verses in Sanscrit were in existence before his time, committed to memory and thus transmitted." We are not able to say what degree of evidence may be attributed to these statements. It is probable that Hœrnle's 'Epigraphical Note on Palmleaf, Paper and Birchbark'[3] contains some more critical information on the subject, but, unfortunately, this publication was not at our disposal.

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[1] Cf. Ferguson, W. l. c. p. 23-25. Watt, G. l. c. p. 170.

[2] Ferguson wrote this in 1850.

[3] In Journ. As. Soc. Beng. Vol. 69, pt. I, No. 2.

Pliny[1] says expressly that the most ancient way of writing was upon the leaf of the Palm tree, an assertion with all the weight of evidence in its favour.

The following quotations give some interesting details :—Marshall, in his account of the Cocoanut Tree, writes :—

"The leaflets are sometimes used to write upon, and the instrument employed to make the impression is an iron stylus, the pen of the scriptures. The stylus was used by the Romans to write on waxen tablets, leather, etc. The leaves of the Palmyra (*Borassus flabelliformis*), or Talipot (*Corypha umbraculifera*), are, however, much more frequently employed for this purpose. Contracts and other legal instruments are often engraven upon tablets of copper, similar in shape to a slip of the talipot leaf, which have occasionally a border of silver or gold. . . . Palm-leaves, when they are prepared to receive the impression of the stylus, are called ollahs. The natives write letters to one another upon ollahs, which are neatly rolled up, and sometimes sealed with a little gum-lac ; in this manner they pass through the post-office. During the operation of writing, the leaf is supported by the left hand, and the letters scratched upon the surface with the stylus. Instead of moving the hand with which they write towards the right, they move the leaf in a contrary direction, by means of the thumb of the left hand. To render the characters more legible, the engraved lines are frequently filled by besmearing the leaf with fresh cow-dung, which is tinged black, by rubbing the lines over with cocoanut oil, or a mixture of oil and charcoal-powder. The natives can write standing, as well as walking, and they rarely use tables.

"Palm leaves, and perhaps the leaves of trees that do not belong to this natural class, were much used by the ancients as writing materials, hence the word leaf (of a book) is synonymous with that of a tree."

The statements respecting the age of Palmyra manuscript books and the number of years they are likely to last, are somewhat conflicting. Ferguson does not doubt that Palmyra-leaf manuscripts 400 or 500 years old exist in Ceylon. He says that they are certainly of a more durable quality than paper, and resemble parchment in their texture, when well prepared.

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[1] Lib. XIII, Cap. 2.

We read in an article written by Brande[1] in 1849 on 'The language and literature of the Island of Bali': "The time at which the manuscript was composed, which I made use of, is the year of Saka 1724 (corresponding to the year of Christ 1802). To judge from the outward appearance I should have taken it to be much older; in 46 years the lontar-leaves (Palmyra) have already become much injured and it seems to prove what is said also of Indian manuscripts, that they can't survive 100 years. This probably is also one of the causes that in Java, in so short a time, almost the whole of the ancient literature was lost, and that when the desire for the old literature was revived, hardly any of the old manuscripts could be discovered. In Bali also we must not look for old manuscripts; however those which are guarded and transcribed in the families of the priests, may almost be considered as original, since in these families the knowledge of language and religion is preserved with the minutest care."[2]

The Palmyra books are never much beyond two feet in length and two inches in breadth, as the size of the webs between the little ribs will not admit of their increase in size.[3]

CULTIVATION IN INDIA.—" This grand palm is not much used in gardens, and perhaps rightly so. It takes up much space, and generally looks unhappy compared with the same species on hill sides near Bombay, where its tall cylindrical stem crowned with immense fan-shaped leaves is a grand feature in the landscape. But in the Botanical Gardens at Calcutta a special use has been found for which it is well adapted. On the outskirts of the garden a gently winding path, about 12 feet in width, has this palm planted near the sides about 10 feet apart; the effect of the thick stems ornamented by the persistent leaf-stalks is strangely happy. To grow this palm quickly a moist climate is necessary, and the seed should be sown where it is required to grow, because it first sends a shoot downwards to a depth of 3-4 feet, and then from the bottom of this shoot the bud, which forms the stem, is developed." (Woodrow). Some few trees that from unknown causes do not flower in spring, put on their flowers in the cold season, and give a scanty supply of toddy, but in spring many are rendered artificially barren by breaking off the flowering bud as it begins to form. These also flower in the winter season, and are called Basanti. They do not give above 2½ maunds of juice, but this is of as much value as the 6 maunds which a tree gives in spring. Either the male or female will answer for the spring or winter crop, but the female alone will yield juice in the rainy season. When this is wanted, the fruit is allowed to form, and afterwards the point of the spadix or stem which supports the clusters is cut and allowed to bleed. This does not prevent a great many fruit on each cluster from coming to maturity. Palms managed thus are called Ghour. The fruit ripens in August, but many of the stems continue to bleed until October.

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[1] Journal of the Indian Archipelago and Eastern Asia, Vol. III, No. 4, April 1849.

[2] Cf. also some notes of Lombok in the 'Journal of the Indian Archipelago', etc., Vol. II, No. 3, p. 161.

[3] Ferguson, l. c. p. 26.

CULTIVATION IN EUROPE.—This species is a stove plant. It grows well in good fibrous loam, leaf mould, and sand, mainly in the former. It is propagated by seeds only which must be sown in strong bottom heat.

Fungal disease of the Palmyra Palm.—In 1906 the Imperial Mycologist, E. J. Butler, described a severe epidemic of disease in palmyra and other palms in the Godavari District of the East Coast of India.[1] As a result of field and microscopic examination, the cause of the disease was stated to be a fungus belonging to the genus Pythium. Butler gave a description of it, under the name of *Pythium palmivorum*, in the Memoirs of the Department of Agriculture in India in February 1907.[2] A fuller account of the disease was published by the same author in September 1910, under the title: 'The Bud-Rot of Palms in India.'[1] It is from this paper that we borrow the following notes :—

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[1] E. J. Butler. Some diseases of Palms. Agricultural Journal of India, Vol. I, p. 299, Oct. 1906.

[2] E. J. Butler. An account of the Genus Pythium and some Chytridiaceæ. Memoirs of the Dep. Agricult. in India, Vol. I, No. 5 (1907), p. 82.

The disease was practically confined to a comparatively limited area in the delta of the Godavari River. A few cases of the same disease were observed at Changarachery (Travancore) in 1907, where the fungus was found producing its characteristic spores in young leaf blades of cocoanut trees in the unexpanded stage of the bud.[2]

The bud-rot is said to have first appeared in Addenkivarilanka, an island in the Gautami Godavari belonging to the Ramachendrapur Taluk, about 1890. From this it spread to both banks of the river and extended along the banks as well as inland. Judging from the extension that has occurred in the area as a whole, the rate of spread is estimated little over a mile a year. It has, however, been ascertained, that in certain places an extension of between 2 and 3 miles occurred. It must not be supposed that the disease is uniformly distributed within its area. Great difference may be observed in the severity of the attack from village to village and even from field to field. It seems that the nature of the soil exercises a direct influence on the susceptibility of the palm to attack. Thus, whilst trees along water-courses and in periodically flooded localities die more quickly and in larger proportion, little disease has been found in the light sandy soils of the sea coast villages. The black soils appear most to favour the disease.

The way in which infection is spread from tree to tree is not yet fully understood. Butler has shown that direct application of the parasitic fungus to the crown of a healthy tree leads to infection of the latter. If this be the case, it is not difficult to account for the spread of the disease by considering the chief possible methods of propagation in similar cases, *viz.*, through the air under certain favourable circumstances, by human agency, especially in cases where the diseased parts of the plant are habitually handled by persons who afterwards come into contact with susceptible portions of healthy trees, *e.g.*, by those who cut the leaves or draw toddy, finally by birds and insects conveying infectious matter on their bodies.

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[1] E. J. Butler. The Bud-Rot of Palms in India. Mem. of the Dep. Agricult. in India, Vol. III. No. 5 (1910). p. 221-280. 5 pl. and 1 map.

[2] E. J. Butler. Report on Cocoanut Palm diseas n Travancore. Bull. Agric. Res. Inst., Pusa, No. 9, March 1908.

Of the four species of palm common in the Godavari Delta only three were attacked, the Palmyra (*Borassus flabellifer*), the Cocoanut (*Cocos nucifera*), and the Beetlenut (*Areca catechu*), whilst the wild Date Palm (*Phœnix sylvestris*) so far as has been observed, remained immune. By far the greatest mortality was noticed amongst Palmyras; Cocoanuts have suffered much less, and Arecanuts are even less liable to attack than Cocoanuts. That the Cocoanuts suffer much less seems to depend in large measure on a natural resistance presented by this species to the parasite. No experiments have been carried out to investigate the susceptibility of the Areca to attack.

Though palms of all ages are liable to the disease, the majority of cases are mature trees. The intensity of the disease varies enormously in different places.

From experiments conducted by Butler we are allowed to conclude that the fungus is capable of killing moderately sized palms in from 5-10 months from the date of first attack. Speaking of death in this connection we are to understand that period when the central shoot, formed of the innermost, partly expanded leaves, withers and dies. The time which elapses between the death of the central shoot and the loss of all the leaves of the crown is much longer. It appears that 3 years or more may pass before all the leaves have fallen.

With regard to the seasonable prevalence of the disease there are villages in the area mentioned which do not show any marked period of maximum intensity, whilst the deaths are more numerous in the villages of Amalapur Taluk in the months from August to February, than from March to July. "This is in close relation," says Butler, "with the relative humidity of the two periods, and applies equally well to the other affected Taluks. There is a less close relation with the rainfall. In the monsoon, especially in its second half, the mortality appears to reach its maximum, but it is high also in the cold weather months of heavy dew and ground

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fogs, when there is usually little rain. A distinct diminution in the mortality is observable in a good many instances after the cessation of the monsoon, followed by the cold weather recrudescence. This is not general, since a few cases can be quoted where no diminution after the rains occurred."

In its earlier stages the disease is usually confined to the large fleshy leaf-sheaths which encircle the apex of the palm. As the outermost of these are exposed to light and air and, consequently, brown and dry, and moreover partially hidden by the cut bases of older leaves, it is not possible to detect the spots on the outer sheaths in standing trees. In such cases the first indication visible is the withering of the central shoot or of one of the expanded leaves. In certain cases the parasite also occurs on the leaf-blades and even on the petioles, and sometimes the top of the stem is also affected. "The spots on the leaf-sheaths vary much in size, from only just visible to six inches or more across. In the inner sheaths they are white at first, becoming brown or reddish later on. On the outer sheaths they may eventually be black. A very early result of the attack is the collapse of affected cells, which leads to the spots being sunk below the level of the surface of the rest of the sheath. The margin of the depression is usually bounded by a raised rim. The early spots are dry and hard and may either be quite free from any external parasitic growth or covered with a white mycelial web. Later on, particularly in the soft heart of the bud, the diseased areas are invaded by numbers of saprophytic organisms, bacteria, moulds and insect larvæ, and the whole is converted into a foul-smelling rotten mass. On the leaf-blades the spots are usually smaller than on the sheaths, not often exceeding an inch in diameter on individual segments. They are straw-coloured in the centre and bounded by a broad dark-brown margin."

The body of the fungus consists of hyphæ forming a mycelium, which may be entirely buried in the palm tissue or may be partly superficial, where it frequently develops a thick white felt over the disease-spots. The hyphæ measure on an average 5-8μ. They are unseptate except in rare cases, especially near where the organs of reproduction are formed. Within the tissues they occur in the intercellular spaces or between adjacent cells and derive their food from the living cells by means of haustoria. The parasite is found in all parts of the leaf, excepting the bundles and bands of sclerenchyma. The reproductive organs arise from the superficial hyphæ. They are of two types, sporangia and resting conidia.

The sporangia are formed terminally on the main branches of the mycelium or on short or long stalks borne laterally on these. They vary much in size and shape. On an average they measure 50 by 35 μ., extremes 38-70 by 33-42. Poor cultures show even smaller ones. The shape is typically pyriform. The narrow end of the ripe sporangium is papillate. There are four types of germination, which must be considered as modifications of the one process: (1) The apex of the papilla swells up into a very thin gelatinous vesicle. The protoplasm of the sporangium passes into the vesicle in a uniform granular mass, forms a number of zoospores by segmentation. The wall of the vesicle ruptures and the ciliated spores escape. (2) Segmentation into zoospores occurs within the sporangium. No vesicle is formed, but the papilla dissolves, or if a vesicle is formed, it ruptures almost immediately. When an opening is formed, the protoplasm escapes and breaks up at once into free zoospores. Intermediate types between this and the foregoing are met with. (3) The zoospores ripen within the sporangium but, on the opening of the papilla, are not able, from one cause or another, to escape. They come to rest after a variable period of movement, round off, become clothed with a wall, begin to germinate and pierce the wall of the sporangium. (4) No zoospores are formed. The sporangium germinates by putting out one or several germ-tubes.

The zoospores measure from 8-10 μ after they come to rest and assume a spherical shape. They germinate rapidly by one or sometimes two germ-tubes.

The second mode of reproduction is by resting conidia. These are spherical, thickwalled, and often yellowish when old. They are formed singly at the ends of usually large hyphæ. Intercalar ones are rare. They measure 25-40 μ in diameter, the wall being up to 4 μ thick. The stalk-hypha shows great variety as regards size, shape, and septation. Germination takes place by a germ-tube which, after a short growth, bears terminal sporangia.

Whilst sporangia are usually found on the attacked plants only during the periods of considerable rainfall or heavy dews, the resting conidia are less common in the rainy season, but very common in the hot dry months. No trace of true zoospores has been discovered.

Butler is inclined to believe that the parasite can pass into a dormant condition actually within the bud of the palm and can recommence activity at a later date, progressing until the growing point falls a prey to the attack and death follows.

There are two ways of fighting the disease. The formation of spores may be checked by cutting off the bud from the stem as soon as the first leaf turns white. Infection of healthy trees can be guarded against by brushing or spraying the outside of the bud below the expanded leaves with a fungicide.

The following suggestions were made for an organised campaign against the disease by Butler in 1906:

"A special staff is required, for it is certain that, at first at least the villagers will be slow to take measures for their own protection. If, however, the results bear out the value of the work, real co-operation may be expected before long. A number of expert palm climbers (such as toddy drawers) should be selected under the charge of an agricultural inspector or some similar official and provided with small axes or saws. They should be instructed to climb all diseased trees, both those in the early stages and those already dead, and to cut off the green tops below the swelling of the leaf sheaths. It is particularly essential that all trees in the early stages should be dealt with, and these can be recognized, where the villagers themselves are unable to do so, by the whitening of one of the leaves towards the centre of the head. After cutting off the heads, the whole of the tops should be collected into a heap in each village and burned. In this way every dead or attacked palm in a selected area would have its power of spreading infection destroyed by burning the diseased parts, and this measure alone, if steadily pursued, is certain to give good results. The infectious matter is confined to the head of the palm and, as the tree is doomed once the disease appears and will yield no further profit, its removal costs little but the actual expense of labour in cutting it down and burning it. To save healthy trees within the affected districts in places where they are surrounded by large numbers of dead or dying trees, is difficult unless the above measures are very thoroughly carried out. But the chances of their infection may be very largely diminished if they are brushed with Bordeaux mixture on the leaf sheaths when the removal of diseased trees commences. Bordeaux mixture is a substance which adheres strongly to the surfaces of plants and being poisonous to fungus spores, it prevents their germination or kills the young germ filaments as soon as they appear. A second gang of toddy drawers should be employed for this work and provided with small vessels containing the mixture and mops of rags for brushing it on to the sheaths. The expanded leaves need not be brushed, but only the leaf sheaths below these. The men employed for removing diseased trees should not be allowed to climb healthy ones, as there is some danger of their conveying the infection on their persons or axes. "To prepare 50 gallons of the mixture, weigh out 6 lbs. copper sulphate, break to powder and dissolve in 25 gallons of cold water by suspending in a piece of gunny sacking in the water. The latter must not be contained in a metal vessel but in a barrel or big earthenware pot. In another vessel weigh out 4 lbs. of fresh quicklime. Slake this gradually till it falls to powder and then, add water up to 25 gallons. Allow it to cool. When cool, add to the copper sulphate solution through a sieve so as to retain any lumps. A thick bluish liquid results which on standing throws down a bluish precipitate, leaving the other part of the liquid clear. To test if fit for use, add a few drops of Ferrocyanide of Potassium to a small quantity of the clear liquid in a dish. If a brownish precipitate appears, more lime must be added till no precipitate is given on testing. Or a clean steel knife may be dipped in it, and if more lime is necessary, a deposit of copper will form on the knife. If none is found, it is ready for use. Stir well before using."

Since the time these suggestions were made, a large campaign against the disease has been in continuous operation in the Godaveri Delta and since January 1910 it is believed that, in spite of many and great difficulties, every part of the infected area is being systematically dealt with. There is no doubt that there has been no slight diminution in the disease within the area of the operations.

The Palmyra Palm in the Tamil Language.—Ferguson has collected a number of proverbial sayings and illustrations from a volume of Tamil proverbs, published by P. Percival. Many of them are so characteristic of native life in India and interesting in themselves that we consider it worthwhile to reproduce the whole. Fibre used as toothpick—a hit at a spendthrift: "He whose father possesses a thousand Palmyra trees has not a fibre to pick his teeth."—Sharpness of the petiole: "What he saw was a snake but what bit him was the stalk of a Palmyra leaf."—Leaves young and old, illustrative of heirship and succession: "It is said that the young leaves of the Palmyra-tree laughed because the dry leaves fell off."—Tenacity with which fruit clings to the tree: "Will the Palmyra fruit fall because a crow alights on the tree?"—Size and weight of the fruit: "Can Palmyra fruit be suspended from the neck of a little bird?"—Tenderness of the germ-taking unnecessary trouble: "Why use a mallet and wedge for splitting the newly germinated root of the Palmyra, that may be split by the hand." Height of absurdity: "As the scorpion stung the Cocoanut tree, the Palmyra swelled in consequence." Felled timber—removal of obstacles: "As an ass perambulated the place where Palmyra-timber has been felled." Falling from a Palmyra-tree—injuring a fallen man: "A snake bit him who had fallen from a Palmyra-tree."—'Yorkshire, though in London': "The fox of the Palmyra-tree is said to have deceived the fox of the City."—Avoid even the appearance of evil—toddy-drinking discreditable: "If you drink under a Palmyra-tree, it will be regarded as toddy."—Palmyra-tree insufficient for shade: "Is the shadow of the Palmyra-tree a shade, or is the friendship of the malignant friendship."—Rustling of leaves—effects of long experience: "Will the fox of the Palmyra grove be frightened by the rustling of leaves?"—'Tell that to the marines:' "As one ascended a Palmyra-tree, and descended without touching the blossom."—The habit of drinking toddy cannot be concealed: "He who drinks milk will belch milk and he who drinks toddy will belch toddy."—Eating a Palmyra-tree—effects of perseverance: "By eating slowly, even a Palmyra-tree may be eaten." How the fruit falls: "The fruit of the tree will fall at its foot."—Young trees—to save your property you must take care of it: "Preserve young Palmyras by cutting, and buffaloes by tying."—Turning the tree to a bad use: "Is it to drink toddy you have reared the Palmyra-tree?"[2]—Witchcraft and basket-making easy arts: "Witchcraft is the easiest of all arts, and the common ola basket is the easiest of all plaits."

THE 'TALA VILASAM'.

There are many descriptions of the Palmyra Palm and its uses written in the various European languages, and nearly all of them mention a Tamil poem, entitled 'Tala Vilasam', which is said to enumerate no fewer than 801 different purposes to which the Palmyra may be applied; and if the writer is possessed of a good imagination, he invariably adds, that the poem in question by no means exhausts the catalogue.

I searched a long time for that poem, of which nothing but the title seemed to be known, and when I found it at last, I was astonished that I had not discovered it sooner. William Ferguson had given a first translation of it about 60 years ago in the appendix of his interesting little volume on the Palmyra Palm of Ceylon.

The poem was written by "Arunachalam, a Poet of Terrukkudantei, the same with Combaconam in the Province of Tanjore."

As the poem is a truly oriental production with the merits and defects of eastern conception, we trust that our readers will not object to our reproducing the poem in extenso, though it may contain a good many repetitions of what has been said above. The fact that it has been translated by a Tamil native accounts sufficiently for the peculiarities of its English style and wording. As we could not procure a copy of the original, we prefer to give it as it stands.

TALA VILASAM.—ON THE PALMYRA TREE.

Invocation of Ganesa.

I invoke Ganesa to help in my composition of the work on the Palmyra tree, in the species of poetry called Kali Venpa, and in presenting the same to the people on the sea-girt earth.

O thou lady, resembling Laksimy who is seated on the beautiful lotus! Thou of sweet expressions whose breasts are under stays, and whose person resembles a peacock! hear me tell you in brief an account of one out of the eight hundred items of things connected with the Palmyra-tree, which is emphatically the Kalpa-tree of the earth.

The various productions of earth created by Brahma came short of men's wants; and there was wanting one substance which had an entire power of assuaging hunger, removing disease, feeding the illiterate and enriching the house; and therefore the people of the earth were as unfixed (in all their worldly prospects) as the water on the leaf of a lotus, made poojas and prayed to Sivan for assistance. Sivan heard their prayers and asked of Vishnu with displeasure the reason of his not having daily attended to his duty of preservation? To which Vishnu, in great obeisance, with one arm folded and the fingers of the other put upon his under-lip replied: there is no fault in my course of duty, but the present amount of things created on the earth by Brahma is insufficient. Upon which, Sivan, in great displeasure and anger, looked at Brahma and asked of him the reason of his not having created things to satisfy all the wants of the people of the earth. Brahma trembled and perspired (through fear) and putting his fingers under his under-lip (as a sign of great respect to a superior) and in faltering language, replied: 'My Lord, who is the operative cause and immaculate! What I have already created is all that I knew.' Parvathi (Sivan's consort) then said to Sivan: 'There is fault neither in Vishnu nor in Brahma,' and thus appeased his anger. Sivan, upon this, after meditating in his own mind, said to Brahma: 'Hear me tell you something to supply the wants of the people of the earth. Create the Kalpa-tree upon the earth also.' At the direction of the crescent-moon-adorned Sivan, Brahma created in abundance Palmyra-trees in the three countries of Panathar, Panyoor and Panangasdoor, and called Palmyra-trees by the names of Pootpady, Ponthy, Panay, and Talam. Let me now tell you the various produce and uses of the Palmyra, much extolled by the people of the earth.

If you carefully turn up the ground by hoeing, hedge it, and bury Palmyra-stones in rows at the distance of eight spans one stone from the other, they will return favour, and will never fail, just as the renown of the wise of spiritual blessing will not. When the stones sprout and become tender plants, if you take good care of them not to let the goat, sheep, cow and wild cow feed upon the plants, they will grow in strength, and with the swords of their stems, armed with indented jags on both their sides, they will destroy the iron age of poverty and protect the earth. When the Palmyra tree grows to the height of two bones length, the roots of the stem that fastened the tree will get dry and fall off in season. A female child and a Palmyra tree, if carefully nurtured, will become fruitful in their tenth year. The principle of the blossom (of the Palmyra tree) develops during the months of November and December; the blossom shoots forth as hoarded treasure for the time of exigency in the months of January and February; and then the tender fruits are formed; and of these tender fruits some do fall from the trees out of season. People collect and cut them to pieces, and give them to the cows to eat. Sins may thus be removed, and the cows will give plenty of milk. When the tender fruits of the tree have become larger, they are some of them separated from the trees, the integuments and the adjacent parts are pared off, and the pulpy kernel within is drunk by the people. The drink will remove various diseases, *simulque supprimet vires gonorrheæ.* Had the celestials and the anti-celestials ever tasted of the pulpy kernel, they would never have gone to churn the milky ocean. When the fruits approach towards ripening, they are some of them separated out of the trees, and laid in the sun for a while; the pulp is then pared and boiled in cocoanut milk mixed with the husked seeds of pulse, and is then eaten. When the fruits have become well ripened, they fall from the trees, give an agreeable odour; the integument is severed, the fruit is then roasted in fire, washed in pure water and the skin is peeled off. Press the fruits with the hands and swallow the pulp of it; even honey, milk and sugar will not resemble the pulp in sweetness: the fruits may also be sprinkled with reserved Palmyra pulp-water and then be used. Also the pulp is expressed, mixed with rice flour, boiled in oil or ghee, and then used as sweet cakes. The Pandal is made in a suitable place, and a certain spot near the Pandal is nicely daubed with cow-dung. Poojah is offered to Ganesa, his aid is implored, and then the ripe fruits are washed in water, broken by beating with a wooden mallet, and the skin is peeled off; the fruits are then put in Kadaca-baskets, reserved Palmyra pulp-water is poured in, well pressed with the hands; the stones are carefully expressed, and put in another Kadaca-basket and undergo a similar process a second time; the stones are then thrown out in a heap; the fibres of the fruits that lie blended with the expressed pulp are carefully separated by a brush, made of the twigs of certain shrubs; the pulp is then poured upon a mat about twelve cubits long which is spread on a Pandal; well spread over the surface of the mat, and left to dry in the sun during the day time; in the evening the mat is folded, in the following morning it is unfolded. The above mentioned process is continued for about eight days, and when the pulp has become well dried and an inch deep, salt and pieces of Perandi-shrub are sprinkled over, lines are drawn with a weed hook (or sickle), or a like instrument at the distance of a span from one another, the dry pulp is pared off from the mat, and then left to dry for a day more in the sun; the square pieces of dried pulp are then folded, put in a Kooday-basket and laid over a Paran-shelf, to be smoked and to serve for future use.

Hear me, O Lady, the process of dried pulp which a rich man would use. In the pulp expressed from good edible Palmyra-fruits, powder of Palmyra-jaggery and ghee are put, and the pulp is then as before spread over the mat, and when the dried pulp gets half an inch deep, it is as before pared off and reserved for time of want. Another process of preserving dried Palmyra-pulp is the following: the dried Palmyra-pulp is cut into small pieces and steeped in

Palmyra molasses, mixed with roasted powder of pepper, sesamum seeds, rice, and cummin; preserved in an earthen pot, the mouth of the pot is well luted, and then these sweet cakes are used by the country people in their feasts. Hear me again: the pulp that is expressed out of the Palmyra fruits that fall scantily in the latter part of the fruit season, is spread over the mat for two days and left to dry very well; the dried pulp is then peeled off into sheets. An offering of cakes made of the flower of the edible Palmyra roots and of dried Palmyra pulp, together with other fruits, is made in Palmyra plantations to Ganesa. The dried Palmyra-pulp that was preserved is protected without contracting grubs that may spoil it, if the owners are devoted to Ganesa during the time. The dried Palmyra-pulp that it thus preserved may better serve the people as food during the rainy season. Griping of the bowels, diarrhœa and lodging of small fish bones in the œsophagus may be removed by eating dried Palmyra pulp. The stones of the Palmyra fruits that are eaten, and of those that are expressed, are divided into four sorts, put in the ground into beds of 4, 5, 6 or 8 layers, covered with earth, watered twice during the months of August and September and the edible Palmyra roots are dug out in the months of January and February. When there is no rain the skin of the root is peeled off, its head is pared away, the root is cloven into halves, its foot is nipped out, left to dry in the sun, the foot is nipped off in the second and third also, the halves are carefully stirred up to dry well, and then collected and preserved. Such dried edible Palmyra roots are powdered and sifted, salt-water is sprinkled upon the flour, fish, herbs, and other fruits are added to it and mixed together, the paste is then put into a conical Ola-basket and steamed; the poor people eat much of it and get strength.

If the flour of the dried edible Palmyra-root (Odial) be mixed with Cocoanut milk, salt-water and fish, and if the paste be steamed, the cake when eaten will daily add strength to any body. The middle pieces of the Odial are cleared of their outer fibrous skin, soaked in water, then dried and powdered; if the flour be mixed with the cocoanut milk, salt-water, fish and herbs, and if the paste be steamed and then ghee be added to it, the cake will indeed be very sweet; if certain fruits and pungent substances be added to the above, the cake will be of an agreeable taste. If the Odial flour be mixed with the scrapings of the kernel of the cocoanut, and powdered rice, cummin, pepper and chilly; if the paste be steamed and the cake be broken and dried, it can be preserved for two months. No other cakes will resemble the above. Sweets are more agreeable to cakes of the above description. If curds, milk, ghee, and cocoanut milk be added to the paste of the Odial flour, and be steamed, the cakes, when used, has the power of *retinendi seminis virilis in corpore sine pollutione, conferendique facultatem horas in thalamo jugali protrahere*, and increasing muscular strength; the person will not be reduced by labour.

I shall now tell you, Lady, of the different kinds of gruel made of the Odial flour; in the boiling water in which fish, chillies, lobsters, acid, grits of rice, have previously been put, in proportion, by little quantities, the Odial flour; stir it, and when it gets boiled and reaches a proper consistency, take the vessel out of the hearth and use it; if certain healthful (*i.e.*, that contributes to the improvement of one's health) fruits be added to the above, anybody may use it. If in water, salt and grits of rice and small fish be put first, and when they get boiled, if Odial flour, mixed with acid and powdered chillies, be poured in and properly stirred, the gruel infused, will be a very healthful one; if herbs and certain fruits be added to the above, the gruel will be a very good one. The people, when they dig the edible Palmyra roots, take some of them and roast in the fire, remove the outer covering and then eat the roots by mastication. If the roasted roots be exposed to the dew and be eaten on the following morning, it will be very nice indeed. The edible Palmyra roots are boiled by steam in water and eaten; also such boiled roots are like the Odial mentioned before, dried in the sun and preserved for future use. The accompaniments that are to be taken with roasted and boiled edible Palmyra roots, are cocoanut, salt,—and pungent substances.

People may eat the sprout that just shoots forth out of the Palmyra stone; the stone, in a certain stage, may be roasted in the fire, then be broken and the kernel be eaten. There is no comparison to the curry or broth made of very tender edible Palmyra roots and cocoanut milk. The kernel that is formed in the Palmyra stone in its advanced stage will be very sweet.

Hear me now tell you the use of the Palmyra stone shell. It will ever serve as fuel for cooking; if the shell be partially burned and the inner coat of the shell be removed, it will serve as coals to smiths; it will also serve as a powder box, tinder box and a pill-vial.

When the Palmyra tree puts forth blossom, it is rendered fit for yielding the juice by pressing it between two poles, and by beating it with the handle of a knife; its end is properly incised, a vessel is adjusted to it, and toddy is collected; if the toddy be presented in Poojah to Sacti, excellent boons may be obtained. Toddy if drunk, *excitabit amorem et cupidinem in illis, qui in rem uxoriam incumbent.* If taken daily, it will increase one's muscular strength and give a gloss to his person; if used by children in small quantity it will remove itch and many other diseases. If powdered load-stone and scoria of iron and file be put into the pot that is attached to the incised blossom, and the toddy collected in such a pot be drunk for seven days in the morning—-asthmatic affections, bloated cheeks and the like may at once be removed—if, in the morning and evening, the pot that should be attached to the blossom be baked in fire, *qui succum in hac olla collectum bibet diutius in copulatione morabitur.* If shell-lime be put in the pot that should be attached to the blossom, and the toddy be used, hunger, thirst, languor and laziness will be removed, heat in the constitution will be destroyed and coolness be created. Toddy will be very sweet if powdered pepper be put in it and boiled. If toddy be boiled nicely, and if slices of ash-coloured pumpkin be boiled in it—the broth, when it is seasoned and used, will create a wonderful power to the stomach to digest any amount of food. If, when the south-wind blows, toddy be collected, strained and poured in a pot, and be boiled until it gets the consistency and colour of Margosa-oil—then be poured either in a new pot or a vessel of Palmyra leaf, the mouth well covered, and the vessel be then exposed to smoke or buried in the earth—the

Palmyra molasses will be candied (*i.e.*, crystallized) : these crystals, if taken into the mouth, will suppress asthma and phlegm.

If the boiled toddy in the above process be still boiled until it sticks a little to the bottom of the vessel and bubbles are formed, you can have Palmyra sugar.

If toddy be so boiled that, if it be taken in a ladle, it will not be drawn into threads, but will break, take it out of the fire, put a little quantity of rice flour and mix it well with the molasses and pour the molasses in pots and little Ola cases; you will have Palmyra jaggery.

If, in the above said stage of consistency, powdered cummin, pepper and sesamum seeds all well roasted be put in the molasses, and if you steadily continue mixing and agitating the molasses, you will have a powder, which may be used to assuage thirst ; such a powder, if it be of the toddy of a male Palmyra tree, may be taken as medical accompaniments ; may also be given to motherless babes. If the proper consistency be not pitched, it will get as hard as sugar-candy.

When toddy ceases to be drawn by the close of March, there will be fruits during the following five months, and during the remaining months there will be dried Palmyra pulp. So, the produce of the Palmyra tree is had in every month of the year. The Palmyra-tree is able to bestow bountifully, and one may eat of its produce in the three seasons of meal every day. The mind will ever love it more than any other thing. If a person only with gratitude to the tree eat of its produce twice or more a day, he will have all the benefits of those that spend the day in fasting and devotion and eat only once a day.

Old Palmyra branches are cut out of the tree every other year, left to dry in the sun a day, made flat by pressing them in a certain manner, and then used for covering and fencing. When the Olas get mouldered, they are used for manuring rice-fields, etc. The inner fibrous bark of the Palmyra stem is used in making cords and ropes, etc., but the outer bark is not so strong as the inner. The Palmyra stem is used in making cots, hedging, and covering an ola book. The white tender Palmyra leaves are used for making baskets of several kinds, as for storing paddy, for keeping cloths, betels and arecanuts, sacred ashes and other things, for measuring grain, oil and the like, for making cases of several species, for drawing water, and for making mats of different kinds. The ribs of the Palmyra Olas are used for making cords and ropes, winnowing baskets, and brooms, etc. The tender Palmyra leaves are used for making umbrellas, fans, dolls, vessels to eat from, and rolls for the perforated ears.

The Olas are used in writing the Veds, Shasters, and Agamas, in making deeds, conveyances, dowries, and other presents, in writing interest bonds, in drawing magic diagrams, in writing letters to friends at a distance, in drawing accounts.

The names of Palmyra trees are numberless, such as, the white, the tall, the short, the black-fruited, etc. The roots of Palmyra branches that attach themselves to the tree, and the webs that lie interwoven between them, fall off in season, and may be used as fuel. If the several ingredients of the male Palmyra tree be all collected, rubbed into a paste and mixed with cow-milk, *et si aliquis, qui vult cum fœmina rem habere, hoc bibet, ille tempus copulationis protrahere proterit.* The tender pith of the Palmyra tree that lies in the top part of the tree is eaten by the people.

The timber of the tree is used for building temples, palaces, houses, alms-houses and inns; also as wall-plates, beams, posts, door-frames, pegs, laths and the like. The stump of the tree may be made hollow and used for keeping salt. The produce of the tree may procure to some fields, houses, and jewels. Peace of mind may be secured; one may live in prosperity and great renown. The Palmyra stone, though boiled or roasted in fire, will still sprout; it is, therefore, of a superior quality.

The Pandava kings have regained their lost kingdom, because they have eaten Palmyra fruits when in the wilderness. The Pandya King and others are said as having worn garlands of Palmyra blossoms.

ILLUSTRATIONS.—Plate XXXVIII shows one of the numerous groves of Palmyra Palms in the northern part of Ceylon. In the country round Jaffna the Palmyra is at once the most conspicuous and the most beautiful feature of the landscape. The mature forest reaches a height of one hundred or more feet.

The photograph reproduced on plate XXXIX and kindly supplied by Mr. Phipson shows a group of palms from the Victoria Gardens in Bombay. The leaves of the regular spherical crown of the Palmyra Palm seem to arise from a huge cluster of fruits. At the foot of the Palmyra there is a young specimen of the same species, and to the right of it a Fishtail-Palm (*Caryota urens)* has developed three large bunches of flowers and fruits, of which, however, only one is distinctly visible.

(*To be continued.)*

A LIST OF INDIAN BUTTERFLIES.

BY

CAPT. W. H. EVANS, R.E.

(Continued from page 584 of this Volume.)

Genus.	*Subgenus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NEMEOBIDÆ —*contd.*		LIBYTHÆINÆ—*contd.*				
Abisara ..	....	echerius. Stoll.	....	Chamba-As. Centr.	= abnormis, M.	Echerius was described from China, but there are no specimens from this locality in the B. M.; prunosa, the southern form is larger and brighter; the Burmese forms are very puzzling and possibly abnormis ought to be separated, both were described from South Burma.
			prunosa. M..	S. C.		
			angulata. M..	Naga-B.		
			bifasciata. M.	An.		
			kausambi. Fd.	Mergui.		
Stiboges ..	....	nymphidia. But.	....	Bhut-B.		
	PAPILIONIDAE.					
Papilio ..	(Ornithoptera.)	helena ..	cerberus. Fd.	Sik.-B.	....	The arrangement of the Papilios is that given by Jordan is the Macrolepidoptera. Moore's subgenera are used for the groups defined by Jordan. The long series of each species kept at the Tring Museum form the basis of Jordan's arrangement; the only alterations I have made are under polytes.
			helia conoides. M.	An.		
		aeacus. Fd.	....	Garhwal-B.		
		minos. Gr. .	....	S.		
		darsius. . Gray.	....	C.		
	(Pangerana.)	aidoneus. Db.	....	Garhwal-Up. B.		
		varuna ..	astorion. Wd.	Kum-B.		
		zaleucus . Hew.	....	B.		
	(Menelaides.)	hector. L..	....	Beng-S.C.		
		jophon. Gray.	....	C.		
			pandiyana M.	S.		
		aristolochiæ. Fab.	....	I.		

Genus.	*Subgenus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PAPILIONIDÆ—*contd.*						
Papilio —*contd.*	(Menelaides)—*contd.*	....	goniopeltis. Roth.	B.		
			ceylonicus. M.	C		
			camorta. M. .	Ni.		
	(Losaria) ..	coon ..	doubledayi. Wall.	B		
			cacharensis. But.	Cach.		
			sambilanga. Doh.	Ni.		
		rhodifer. But.	....	An.	might be put as race of coon.	
	(Byasa) ..	latreillei. Don.	....	Garhwal-Sik-		
			polla. De N...	Up. B.		
		adamsoni. Gr.	....	B.		
		crassipes. Ober.	....	B.		
		nevilli. W. M.	....	Cach.		
		philoxenus. Gray.	....	Kash-Nep.	lama, Ober, is confined to W. China.	
			polyeuctes. Db.	Sik-B.	Bing as a var of philoxenus.	
		dasarada. M.	....	Sik-As.	Bing as a var of philoxenus.	
			ravana. M. ..	Kash-Kum.	Bing as a separate species.	
			barata, Roth,	B.		
		plutonius..	pembertoni, M.	Bhut.		
	(Cadugoides.)	agestor. Gray.	....	Sik-B.		
			govindra, M.	Kash-Kum.		
		epycides. Hew.	....	Sik-As.		
			curiatius, Fruh.	Up B.		
			hypochra. Jor.	S. B.		
		slateri. Hew.	....	Sik-Up B.		
			marginata. Ober.	Shan St.		
			tavoyanus. But.	Ten.		
	(Chilasa) ..	paradoxus.	telearchus. Hew.	As.-B.		
			(d. danisepa. But).			
		clytia. L ..	....	Simla-B. S. C.	....	Jordan considers the forms of clytia to probably represent local races in the making.
			(v. casyapa. M.)	I.		
			(v. lankeswara. M.)	S. C. Ten.		
			(v. commixtus. Roth.)	Sik-As.		
			(v. onpape. M.)	B.		
			(v. papone. Wd.)	S. B.		
			(v janus. Fruh.)	S. B		
			(d. dissimilis. L.)	I. B. C.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PAPILIONIDÆ—*contd.*						
Papilio —*contd.*	(Chilasa) —*contd.*	....	flavolimbatus. Ober.	An.		
	(Tamera) ..	castor. Wd.	....	As		
			polias Jor. ..	Sik-Up. B.		
			mehala. Gr. S.	S. B.		
		mahadeva. M.	....	S. B.		
		dravidarum. W.M.	....	S.		
	(Papilio) ..	machaon ..	asiatica. Mén.	Bil. Chit-Nep.	Sphyrus Hüb, an European variety.	
			(v. ladakensis M.)			
			sikkimensis. M.	Sik-Bhut.		
			verityi Fruh.	Up. B.		
		xuthus. L.	....	Up. B.		
		demoleus. L.	....	I. Up. B.		
			malayanus. Wall.	S. B.		
	(Charus) ..	demolion. Cr.	....	Ten.		
			liomedon. M.	S.		
		noblei. DeN	....	B.		
		chaon. Wd.	....	Nep-B.		
			ducenarius. Fruh	Ten.		
		helenus L.	....	Muss.-B.	....	Jordan gives sakontala and walkeri as separate species in the helenus (charus) group: of walkeri only one specimen is known and of sakontala very few, but there are also several aberrations of polytes known, that are neither sakontala or walkeri: under the circumstances would it not be better to sink all these specimens as aberrations of polytes. No doubt the male organs of walkeri and sakontala are very different to those of polytes, but is not this rather to be expected with aberrations.
			daksha M. ..	S.		
			mooreanus. Roth.	C.		
		iswara White.	....	Mergui.		
		fuscus ..	prexaspes Fd.	B,		
			andamanicus Roth.	An.		
		hipponous.,	pitmani. El & DeN.	S. Ten.		

PAPILIONIDÆ—*contd.*

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
Papilio—*contd.*	(Laertias)...	polytes ..	romulus Cr.	I. B. C.	=sakontala Hew, walkeri Jan, casual aberrations polytes. L. China.	Jordan confines polytes to China, giving the Indian race as romulus, the name under which the hector like females were described, while polytes was used for the aristolochiae like females. I propose here to employ stichius for the latter form of female though up to the present it has only been used for the females of this form that have no spot in the cell of the hindwing. The female resembling the male stands as cyrus. I propose the name *stichioides* for the aristolochiae like females from the Andamans and Nicobars, where the romulus form does not occur.
			(Female d. cyrus. Fab).			
			(Female d. stichius Hüb)			
			nikobarus. Fd.	An. Ni.		
			(Female d. stichioides. Ev).			
	(Iliades) ..	polymnestor Cr.	......	Sik-S.		
			parinda M.	C.		
		mayo. Hew.	......	An.		
		memnon ..	agenor. L.	Sik-B.		
		protenor Cr	......	Kash-Kum.		
			euprotenor. Fruh-	Sik-B.		
		rhetenor Wd.	....	Kum-B.		
			(Male v. leucocelis. Jor.)	....	Form with a dorsal white patch on the forewing above.	
	(Mimbyasa)	janaka. M.	....	Muss-Sik.	....	Moore places janaka and bootes in Byasa with latreillei, etc : I propose *Mimbyasa* as the subgenus for these two species.
		bootes. Wd.	....	As.		
	(Achillides)	elephenor. Wd.	....	Up. As. Naga.		
		dialis ..	schanus. Jor.	S. Shan St.	=doddsi. Janet, Tonkin, described from Tonkin.	
		bianor ..	gladiator. Fruh.	S.B.	....	Seitz records P. demetrius Cr. (=carpenteri but) from N. India, but this seems to be an error.
		polyctor Bdl.	....	Chit-Nep.		
			ganesa. Db.	Sik.		
			triumphator. Fruh.	As.		
			significans. Fruh.	S. B.		
		paris. L. ..	....	Kum-B.		
			tamilana. M.	S.		
		arcturus. Wd.	....	Nep-B.		
			arius Roth ..	Kash-Kum.		
		krishna M.	....	Sik-Up. B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PAPILIONIDÆ —*contd.*						
Papilio —*contd.*	(Achillides) —*contd.*	crino. Fab.	....	Beng. S.	montanus, Fd. an. , ab.	
			fruhstorferi, Rob.	C.		
		buddha, Wd.	....	S.		
		palinurus. Fab.	....	B.		
	(Pathysa) ..	eurous ..	cashmirensis, Roth.	Kash-Kum.		
			Sikhimica. Heron.	E. Kum-As.		
		glycerion, Gray.	....	Sik-up B.		
		agetes. Wd.	....	Sik-B.		
		nomius, Esp.	....	Sik-S. C.		
			swinhoei. M.	Up As-B.		
		aristeus ..	anticrates, Db.	Sik-As.		
			hermocrates. Fd.	B.		
		antiphates.	pompilius, Fab.	Sik-B. S.	antiphates, Cr., China.alcibiades, Fab., Java.	
			naira. M. ..	Trav.		
			ceylonicus, Eimer.	C.		
			epaminondas, Ober.	An.		
	(Meandrusa)	gyas. Wd ..	....	Sik-As. SB.		
			aribbas, Fruh.	Up. B.		
		payeni ..	evan, Db.	Sik-As.		
			amphis, Jor.	B.		
	(Zetides) ..	cloanthus, Wd.	....	Kash-B.		
		sarpedon L.	....	Him-B.		
			teredon, Fd.	S. C.		
		doson. Fd.	....	C.	Jordan, sic; he rejects jason, L.	Jordan separates eurypylus and doson on the male organs; superficially eurypylus differs in that on the underside of the hindwing the dark sub-costal band is usually posteriorly united to the dark sub-basal band and does not end inside the silver band; if the two dark bands are not united the basal margin of the silver band is notched at the sub-costal vein. There are several specimens of cheronus in the B. M. over the label "acheron, Fruh."
			eleius, Fruh.	S.		
			axion, Fd.	Kum-B.		
		eurypylus..	cheronus, Fruh.	Sik-B.		
			macronius, Jor.	An.		
		bathycles ..	chiron, Wall.	Sik-B.		
		agammemnon, L.	....	Kum-B.		
			menides, Fruh.	S. C.		
			andamana, Lathy.	An.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PAPILIONIDÆ —*contd.*						
Papilio —*contd.*	(Zetides) —*contd.*	....	decoratus, Roth.	Ni.		
	(Paranticopsis).	macareus..	indicus, Roth.	Sik, Bhut.		
			lioneli, Fruh.	As.		
			gyndes, Jor.	B.		
		xenocles, Db.	....	As.		
			phrontis, De N.	E, Kum.-Bhut.		
			kephisos, Fruh.	B.		
		megarus, Wd.	....	Sik.-B.		
			similis, Lathy.	Shan. St.		
Leptocircus.	....	curius, Fab.	....	Naga H.-B.		
		meges ..	virescens, But.	B.	meges, Zink., Java.	
			indistincta, Tytler.	Naga H.		
Teinopalpus.	....	imperialis, Hope.	....	As.-Up. B.		
			himalaicus, Roth.	Nep.-Bhut.		
			imperatrix, De N.	Taungoo.		
Armandia.	....	lidderdali, Atk.	....	Bhut.-Up. B		
Parnassius.	(Parnassius).	jacquemontii, Bdl.	....	Kash.-Kum	=himalayensis, El.	Stichel gives Parnassius stubbendorfi tartarus from Kashmir but the locality seems very doubtful.
			impunctata, Aast.	Sik.		Fruh. gives the Sikkim form of jacquemontii as himalayensis, but this name was used by Elwes for what is now called jacquemontii : the only form described from Sikkim is impunctata ; there are no Sikkim specimens in the B. M.
			chitralensis, M.	Chit.		
		epaphus, Ober.	....	Kash.-Kulu.		
			sikkimensis, El.	Sik		
		hardwickii, Gray.	....	Chit.-Kum.		
			viridicans, Fruh.	Sik.		
	(Koramius).	delphius ..	chitralica, Verity.	Chit.	hunza, Cr., Hindu Khush.	
			stenosemus, Hon	Kash.		
			stoliczanus, Fd.	Lad.-Kulu.	atkinsoni, M. a female ab or var.	
			lampidius, Fruh.	Sik.	=whitei, Bing.	
	(Tadumia).	acco, Gray.	....	Lad		
			gemmifer, Fruh.	Sik.		
		simo, Gray.	....	Lad,		
			acconus, Fruh.	Sik.	=mœlleri, Bing.	
	(Kailasius).	charltonius Gray.	....	Chit-Sik.		
		imperator.	augustus, Fruh.	Sik.		
Hypermnestra.	....	helios ..	maxima, Lang.	Bal.	=balucha M : helios, Nick., Persia.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ.						The arrangement of the Pieridæ differs little from that given by Bingham. Ixias is placed after Appias.
Leptosia ..	....	xiphia, Fab.	....	I. B.		
			nicobarica ..	Ni.		
Delias ..	(Piccarda) .	agostina, Hew.	....	Sik.-B.	Fruh. sep infumata, As-B.	
		singhapura	agoranis, Gr. S,	S, Ten.		
		hyparete ..	hierte, Hüb...	E. Kum-B.		
			ciris, Fruh...	S. Ten.	metarete But., Malay Penin.	
			ethire. Doh..	Beng-N Madras.		
		eucharis, Drury.	....	I. B. C.		
		descombesi	leucacantha, Fruh.	Sik.-B.	descombesi, Bdl, Cochin China, Fruh. sep female vars auriga and leucogæa.	
	(Delias) ..	belladonna, Fab.	....	Kulu-Kum.	......	The forms of belladonna are puzzling: typical belladonna occurs throughout its range, but from Sikkim Eastwards it is rare; ithiela being the common form: sanaca flies with belladonna in the W Himalayas and so cannot be regarded as a seasonal form, it grades to belladonna and so cannot be regarded as a separate species though considered o by some authors.
			(v. sanaca, M.)			
			ithiela, But.	Sik.-B.	Fruh. sep berinda M., As and perspicua Fruh., Up. B.	
		aglaia, L...	....	Sik.-B.		
			beata, Fruh.	Ten.		
		thysbe ..	pyramus, Wall.	Sik.-B.		
			kandha, Doh.	N. Madras.	thysbe, Cr., China.	
Prioneris..	...	thestylis, Db.	....	Muss-B.		
			jugurtha, Fruh.	Ten.		
		sita, Fd. ..	....	S. C.		
		clemanthe, Db.	....	Sik.-B.		
Anaphaeis..	....	mesentina, Cr.	....	I. Ni.		
			taprobana, M.	C.		
Baltia ..	....	shawii, Bates.	....	Chit-Lad.	......	I have seen a Baltia caught in Sikkim: it is very close to butleri. The Indian form of shawii is larger and lighter than Central Asian specimens but the B. M. material is very scanty.
		butleri, M.	....	Lad.		
			sikkima, Fruh.	Sik.		
Aporia ..	(Aporia) ..	soracta, M.	....	Kash.-Kum.	? = denigrata. Fruh. Punj., N.W.F.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ—*contd.*						
Aporia —*contd.*	(Aporia) —*contd.*	leucodice..	balucha, M...	Bal-Chit.	......	A. leechii is a good race of balucha and has nothing to do with soracta. In the B. M. as female balucha are placed several yellow butterflies caught by me in Chitral in quite different localities to those frequented by balucha: they are in fact a form of nabellica and I propose to call them *hesba*: they vary from nearly white to lemon yellow, more or less dusted with black scales but never so profusely as nabellica often is: the hindwing is rarely dusted with black scales.
			leechii, M. ..	Hunza-Lad.		
		nabellica, Bdl.	....	Kash-Kum.		
			hesba, Ev. ..	Chit.		
		larraldei ..	harrietæ, DeN.	Bhut.		
	(Metaporia)	agathon, Gray.	....	Nep-As.		
			phryxe Bdl. .	Kash-Kum.		
			(v. caphusa, M.) (v. ariaca M.)			
Pieris ..	(Pieris) ..	brassicæ, L.	....	Chit-As.		
		deota, DeN.	....	Kash-Lad.		
		canidia, Sparr.	....	Chit-up B.	......	In the B. M. the series of canidia from S. India presents a different appearance to the numerous specimens from N. India, though it is not easy to put the difference in words: the Southern form is larger with the black markings more developed especially those on the margin of the hindwing. I propose to call this race *canis*.
			canis, Ev. ..	S.		
		naganum, M.	....	As-up B.		
		rapae, L. ..	....	Chit Lad.		
		melete ..	ajaka, M. ..	Kash.-Up B.	=montana, Verity (E form) melete Men,:China.	Pieris is here extended to embrace certain closely allied genera. melete from China is a large and very distinct form: Indian specimens present a lot of variation, dry season Kashmir specimens being very like napi: melaina from the Chumbi valley is very distinct, but the Eastern form separated by Verity as montana resembles the form from Mussoorie, etc., very closely.
			melaina, Röb.	Sik-(Chumbi).		
		krueperi ..	devta, DeN...	Bal-Chit Lad.		
	(Parapieris	callidice, Esp.	....	Chit-Garhwal.	Röb, Indian race as kalora M.	
		chumbiensis, Den.	....	Sik-(Chumbi).		
	(Pontia) ..	daplidice, L.	....	Bal-Chit-Lad.	Röb, Indian race as moorei.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes*
PIERIDÆ—*contd.*						
Pieris—*contd.*	(Pontia) —*contd.*	glauconome, Klug.	....	Bal-Chit. Panj.		
	(Synchloe).	chloridice, Hüb.	....	Chit-Lad.	Recorded from Kumaon but probably an error.	
		belia	.. daphalis, M..	Chit-Kunawur. Panj.		
	(Anthocaris).	lucilla, But.	....	Panjab.		
Huphina ..	....	nerissa	.. phryne, Fab..	Nep-As.	nerissa Fab. China.	
			evagete, Cr..	I. C.		
			dapha, M. ..	As.-B.		
			lichenosa, M.	An.		
		nadina, Lucas.	....	Sik.-B.,		
			remba, M. ..	S.		
			cingala, M. ..	C.		
			andamana, Sw.	An.		
		lea, Db. ..	....	S. B.		
Appias ..	(Tachyris)..	nero.	.. galba, Wall ..	Sik-B.	nero Fab. Java.	
			figulina, But.	Ten.		
	(Appias) ..	lyncida	.. hippoides, M.	Kum-B. -Orissa.		
			latifasciata, M.	S.		
			taprobana, M.	C.		
			nicobarica, M.	Ni.		
		libythea, Fab.	....	Panj.-Sik.-S. C.		
			zelmira, Cr.	As.-B. Beng.		
	(Catophaga)	albina ..	confusa. Fruh. (female v. semiflava. Fruh).	Sik.-B. Beng.	albina, Bdl., Moluccas.	The arrangement of the Catophaga and Hyposcritia sections of Appias is exactly as given by Fruhstorfer: no doubt the series on which it is based is better than the poor one in the B. M. He states that the melania group differs from the albina group in that the melania males have a broader grey apical patch, formed of big diffused spots. I have placed wardi as a race of melania.
			swinhoei. M.	Centr.-S.		
			venusta. M. (female flava. Röb.)	C.	neomba, Bdl., Sumatra.	
		melania ..	darada. Fd.	Sik.-As		
			adamsoni. M.	B.		
			wardi, M.	S.		
			yaksha, Fruh.	Poona Dist.		
			paulina Cr.	C.	=lankapura M., galene, Fd., fasciata, Fruh., an ab.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ.—*contd.*						
Appias.—*contd.*	(Catophaga)—*contd.*	melania—*contd.*	galathea, Fd.	An.-Ni.		
	(Lade)	.. lalassis Gr. S.	....	S. B.		
	(Hyposcritia.)	indra, M...	....	Nep.-B. Beng.		
			shiva. Sw.	Poona Dist.		
			statilia, Fruh.	S.		
			narendra. M.	C.		
		lalage, Db.	....	As.-Naga Hill.	......	These races of lalage are not very satisfactory: typical durvasa and lalage differ, but both forms meet in Sikkim.
			durvasa. M.	Kulu-Sik.	=pseudolalage, M. confluens Fruh., an ab.	
			argyridina. But.	B.		
			lagela. M.	S. B.		
Saletara ..	....	panda ..	chrysea. Fruh.	Ni.		
Ixias ..	....	pyrene ..	rhexia, Fab..	Kulu-Up-B.	pyrene L., and evippe, Dr., China.	The forms of Ixias are very puzzling and I hope the arrangement given will prove satisfactory: rhexia is the large hill form with a white female and grades with pirenasse the plains form: in South India the prevailing form of male is very like cingalensis, but Ceylon females have the base of interspace 3 yellow. South Indian females are very variable. Latifasciata, the South Burma race, has a very pale dry season form (=pallida, citrina. M.) which Bingham treated as a separate species.
			pirenassa, Wall.	I.B. (plains)		
			cingalensis, M.	C.	Fruh. gives females vars conectens and nivescens.	
			latifasciata, But.	S. B.		
			andamana, M.	An.		
		marianne Cr.	.....	Kum-S. C.		
			nola, Sw.	.. Mahableshwar.		
Dercas ..	....	verhueli ..	doubledayi, M.	Sik-Bhut.	verhueli, Hoev, China.	
			pallidus, Fruh	As.-B.		
		lycorias, Db.	....	Sik.-As.		
			(v. decipiens, DeN.)	....	=brindaba, Sw. ..	
Gonepteryx	....	rhamni ..	nepalensis, Db.	Chit-Up-B.		
		zaneka, M.	..	Kash-Kum.		
			zanekoides, DeN.	Up-B.		
			chitralensis, M.	Chit.		

PIERIDÆ—*contd.*

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
Catopsilia.	....	pyranthe, L.	....	I. B. C.		
		fiorella, Fab.	....	I. B. C.		
		crocale, Cr.	....	I. B. C.	......	Fruh. gives many forms of male and female varieties of crocale and pomona but they hardly seem worth retaining: Mr. Bell has proved that these two species have distinct larvæ.
		pomona, Fab.	....	I. B. C.		
		scylla, L...	....	S. Ten.		
Colias ..	....	hyale ..	lativitta, M..	Bal-Chit-Kum.	hyale L., erate Esp. Europe.	Röber treats erate and hyale as separate species : Fruhstorfer unites them : lativitta is the erate form which grades with glicia, the hyale form with the spotted border : pallidus is the white form of female.
			(male v. glicia, Fruh.)			
			(female d. pallida, Röb.)			
			(h. chrysodona, Bdl.)	Bal-Chit.		
			nilagiriensis, Fd.	S.		
		ladakensis, Fd.	....	Kash-Muss.	......	I believe that thrasibulus and ladakensis will eventually prove to be races of the same species. Fruh. described phicomone phila from a single male from Kashmir ; he has since found that the locality was erroneous.
			berylla, Faw.	Sik.		
		cocandica.	thrasibulus, Fruh.	Lad.		
		alpherakii.	chitralensis, Verity.	Chit.		
		wiskotti, Std.	....	Chit.		
		dubia, El..	....	Sik.	=? miranda, Fruh.	
		stoliczana, M.	....	Kash-Lad.	? race of eogene ..	
			miranda, Fruh.	Sik.		
		eogene, Fd.	....	Chit-Kum.	......	The eogene group is very puzzling : in the B. M. there are series of eogene from Chitral and Baltistan, agreeing " fairly " well: from the same districts in Ladak there are numerous specimens arranged as leechii Gr. and stoliczana but the forms seem to grade : miranda first recorded by Fawcett as leechii (hence Swinhoe giving Sik. as a locality for the latter) is a very unsatisfactory form, *vide* Elwes' remarks when describing the form dubia, which probably = miranda. I believe that all are forms of eogene.
			(female d. cana, Röb.			
			leechii, Gr...	Lad.	? var of stoliczana.	
		fieldii, Mén.	....	As.-Up-B.	......	The eastern form of fieldii is just like the Chinese form, *i.e.*, true fieldii.
			edusina, But.	Chit-Sik.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ—*contd.*						
Terias	(Kibreeta)	libythea, Fab.	....	I. B. C.	Fruh. sep fruhstorferi M., As.-B.	
	(Nirmula)	venata, M.	....	I. B. C.	Fruh. sep rama M., S. C. and sikkimica M., Sik B.	
		laeta, Bdl..	....	I. B.	Fruh. sep pseudolacta M., Ten.	
	(Terias)	hecabe, L..	....	I. B. C.-An. Ni.	......	Fruh. separates hecabe and silhetana (given as a race of blanda) into a number of races in Lepidoptera Indica 26 "species" are given. I do not see that any good purpose is served by retaining any varieties or races except moorei, whose d. s. f. is as typical silhetana.
		silhetana, Wall.	....	Sik.-B. S. An.	Fruh. as race of blanda M., Java = ? hecabe.	
			moorei, But..	Ni.		
		andersoni, M.	....	Muss-B.?C.		Andersoni certainly occurs in Sikkin, though Bing. doubted it. Sari is recorded from S. India and Ceylon: the only specimens in the B. M. marked as such are two from Ceylon which may be andersoni, but are certainly not sari.
		sari, Hors.	....	Ten.	Fruh. Indian race as sodalis, M.	
	(Gandaca)	harina	assamica, M. burmana, M. andamana, M.	Beng. Sik-up B. S. B. Ten. An.		
Colotis	(Colotis)	calais, Cr..	....	Panj. Sind, Cutch.	=dynamene, Klug.	amatus constantly differs from calais in that the black spot on the margin near the dorsum is not detached and quadrate. The dimorphic white female of amatus does not seem to have been named: I propose to call it *albina*. I have omitted phisadia, God., as the only record of it is one specimen from Mooltan, which very likely was a hybrid between vestalis and protractus: similar hybrids have been recorded from Karachi. :
			amatus, Fab. (female d. albina, Ev.)	I. C.	=modesta, But., cypræa, Fab.	
		protractus, But.	....	Bal.-Panj. Cutch.		
		vestalis, But.	....	Bal. Panj.-Central I.	=puellaris, inter missus, But.	
	(Madais)	fausta, Oliv.	....	Bal. Panj.-Bombay.		
			fulvia, Wall..	S. C. Beng.	=tripuncta, But.	
	(Callosune)	etrida, Bdl.	....	I.		
			limbata, But.	C.		
		eucharis, Fab.	....	Centre I.-S. C.		
		danae, Fab.	....	Bal-S. C.	=subroseus, S.W., dulcis, But.	The form of danae from Sind is almost worth separating.
Hebomoia		glaucippe, L.	....	Central I. Nep.-B.		
			australis, But.	S. C.	=ceylonica Fruh., C form-	glaucippe and australis seem to both occur in S. India.
			roepstorfii, W.M.	An.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ—*contd.*						
Pareronia.	....	avatar, M..	....	Sik.-B.		
			paravatar, DeN.	Ten.		
		valeria ..	hippia, Fab..	I. B.	......	Typical ceylanica (a w. s. f.) is confined to Ceylon; its. d. s.f. fraterna (=spiculifera) occurs in S. India and Ceylon, while in certain parts of S. India it seems to grade with hippia. Pingasa seems to be a w. s. f. confined to S. India. I believe that pingasa and ceylanica are races of the same species and possibly hippia may eventually turn out to be conspecific. More dated specimens from all districts are wanted, Naraka presents certain constant, though small, differences.
			(female v. livilla, Fruh.)			
		pingasa, M.	....	S.		
			naraka, M. ..	An.		
		ceylanica, Fd.	....	S. C.	=fraterna, spiculifera. M.	
LYCÆNIDÆ.		GERYDINÆ.				
Gerydus ..	....	symethus. Cr.	....	Ten.		
		boisduvalii, M.	....	Sik-B.	=irroratus, Druce, Siam.	
			longeana. DeN.	Up B. (dry zone).		
		assamensis. Doh.	....	As.		
		ancon, Doh.	....	Ten.		
		croton, Doh.	....	B.		
		biggsii, Dist.	....	B.	=gopara, DeN.	
Allotinus..	....	drumila M.	....	Sik.-As.		
		subviolaceus, Fd.	....	S. B.		
		horsfieldii, M.	....	As.-B.		
		taras, Doh.	....	S. B.		
		panormis, El.	....	Karen. H.		
		nivalis, Druce.	....	Ten.		
		multistrigatus, DeM.	....	Sik.-B.		
Logania ..	....	marmorata, M.	....	S. B.		
			watsoniana. DeN.	Up. B-		
			massalia. Doh.	Up.As.		
LYCÆNIDÆ.		LYCÆNINÆ.				
Pithecops .		hylax. Fab.	....	Sik.-B.	......	In the arrangement of the Lycæninæ Bingham has more or less been followed: Swinhoe's arrangement is very different.
		fulgens. Doh.	....	As.		
Neopithecops.		zalmora. But.	....	I. B. C.		
Spalgis ..		epius, Wd.	....	I. B. C.		
			nubilus, M.	An.-N. I.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ.—*contd.*		LYCÆNINÆ—*contd.*				
Taraka ..	....	hamada, Druce.	....	Sik.-B.		
Megisba ..	....	malaya, Hors.	....	....		
Una ..	....	usta, Dist.	....	Naga H.		
Cyaniris ..	(Notarthrinus).	vardhana. M.	....	Kash-Kum.	......	Dr. Chapman in P. Z. S., 1909, I. p. 419 gave a revision of the genus "Lycænopsis" (*vice* Cyaniris rejected) based on the male organs; lilacea was unfortunately omitted: with a few alterations Dr. Chapman's arrangement is here followed.
		musina ..	musinoides, Sw.	Khasi-Ten.	musina, Snell, Java.	The Javan musina is distinct enough, but without examining the male organs I do not see how musinoides is to be distinguished from jynteana, Binghami can be recognised by the even wide dull brown border, below it is very like jynteana.
		bingnami, Chp.	....	B.		
	(Cyaniris)..	melaena, Doh.	....	S. Ten.		
		marginata, DeN.	....	Kum.-B.		
		akasa.Hors.	....	S.C.		
		albocærulea, M.	....	Simla--Up B.		
		transpecta, M.	....	Sik.-B. Ni		
		lilacea, Hamp.	....	S.		
		puspa,Hors.	....	I. B. C. An.	......	Dr. Chapman states that placida and jynteana are races of limbata; I have seen the specimens he examined and each of the so called jynteana I would have identified as placida: Moore's type of jynteana from the Khasi Hills (I have not seen DeN's type) and of sikkima from Sikkim are forms of argiolus and I am sure that an examination of their male organs would confirm this.
			cyanescens. DeN.	Ni.		
		albidisca, M.	....	S.		
		dilecta, M.	....	Simla-Up. B.		
		lanka, M.	....	C.		
		limbata, M.	....	As. Beng-S. C.		
			placida. DeN.	Sik.-B.		
		argiolus ..	cœlestina, Koll.	Chit-Kum.	=puspargiolus, bothrinoides, albocœruleoides Chap. ? parrishii, Rhé Philippe. sikkima. M.	Jynteana is a very variable form: I do not think that Dr. Chapman's varieties are worth retaining: Victoria is, I think, a d s. f. form "greyed over": I have seen similarly "greyed over" specimens of puspa, dilecta and placida. Parrishii probably=Jynteana (or ? musinoides or binghami): in a difficult group like this to describe a new species from a single specimen without even examining the genitalia is inadvisable.
			jynteana, DeN.	Sik.-Up. B.		
			(v. victoria, Sw).	....		I have specimens of imbata from Assam.

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.,*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ.—*contd.*				
Cyaniris —*contd.*	(Cyaniris).	huegeli, M.	....	Kash-Kum.	......	Dr. Chapman states that huegeli is conspecific with cœlestina: I have left them separate for the present: it is not a case of seasonal variation but may be dimorphism. Breeding experiments are necessary. Huegeli does not occur in Chitral though cœlestina is common. I place oreana and singalensis here: in size, etc., they are very like huegeli.
		oreas	oreana, Swin.	Khasi.	oreas=Leech, China.	
		singalensis. Fd.	....	C.		
	(Bothrinia)	chennellii, DeN.	....	As.-Up. B.		
Lycæna	(Plebeius)	christophi	samudra, M,	Chit.-Kash.	=bracteata=But.	L. bracteata is given by Seitz separately as a race of argyrognomon, Berg., the type specimen is an exact synonym of samudra. The Chitral form of samudra differs in having the discal spots on the forewing below very enlarged.
		loewii, Zell.	....	Chit.		
			chamanica, M.	Bal.		
		cytis, Lang.	....	Chit.	......	The Chitral form of cytis is typical; the form of iris is rather darker than the typical form from Alai.
		iris, Std.	....	Chit.		
	(Scutilantides).	baton	cashmirensis, M.	Bal.-Chit.-Kash.	=vicrama, M. hylas Esp is a different species.	
	(Latiorina).	orbitulus	jaloka, M.	Kash.		
			leela, DeN.	Lad.	=ellisi, DeN.	The Chitral form of orbitulus is very different to jaloka and leela, being more like the European form: the male above is a brilliant shining light blue green, the outer margin being rather broad, there are no white spots above, the spot at the end of the cell is black; the female is brown with a white encircled black spot at the end of the cell and some obscure white postdiscal spots: it is larger than jaloka. I propose to call it *walli* after Maj. F. Wall, I. M. S., who obtained a good series at 12,000 feet in July 1910.
			walli, Ev.	Chit.		
	(Albulina)	pheretes	lehana, M.	Chit.-Sik.	......	L pheretes lehana and asiatica occur together in Sikkim.
			asiatica, El.	....	Sik.	
	(Lycæna)...	metallica, Fd.	....	Chit.-Lad.	......	As pointed out by Swinhoe, metallica and omphissa are separate: Chitral specimens of metallica are not so green as the typical form.
		omphissa. M.	....	Lad.		I have used Swinhoe's subgenera with addition of *Tiora* and *Bryna* (*vice* Polyommatus): Tiora is for the simple eyed section with metallic spots on the hindwing below: a new subgenus is perhaps required for sebrus.
		galathea, Blanch.	....	Chit.-Kum.		
		younghusbandi. El.	....	Sik.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Lycæna —*contd.* ..	(Aricia) ..	astrarche, Berg.	....	Bal.-Chit.-Kum.	=medon, L.	
		eumedon. Esp.	....	Chit, Gilgit	=antiqua Std., jermyni, Sw.	In Chitral typical eumedon and antiqua fly together and intergrade.
	(Bryna) ..	stoliczana, Fd.	....	Chit.-Sik.	=ariana M. drasula, Sw.:sutleja, and pseuderos, M.	I believe only one stoliczana like species flies in India, of which balucha is a race; Seitz gives eros sutleja and balucha; stoliczana and icarus are very variable but cannot, I think, be further separated into well defined races or varieties.
			balucha, M.	Bal.	usually as a race of eros Ochs.	
		icarus, Rott.	....	Bal.-Chit.-Lad.	=persica, Bien.: fugitiva, But.: chitralensis, Sw.: drunela, Sw.	
	(Tiora) ..	sebrus ..	shandura, Ev.	Chit.	sebrus, Bdl., Central Asia and Europe.	L. *shandura* is, I think, a race of sebrus, Bdl.: it differs however in having obscure metallic spots near the anal angle of the hindwing below: shandura is smaller than sebrus, dull dark blue above, below the spots are very small and regular and arranged just as in sebrus,
		devanica, M.	....	Chi.-Lad.		L. devanica is a large species with the blue colouration on the forewing very reduced and a black female: it flies at 8000 feet in Chitral with sartoides. On the Shandur Pass (12000 feet) there flies a third form very similar to devanica differing in being much smaller (size of iris) and in having the blue colour above extended to the margin. I propose to call it *gracilis*: the cilia are chequered as in devanica.
	(Phengaris)	sarta ..	gracilis, Ev.	Chit.	sarta Alph, Turkestan.	
		atroguttata Don.	sartoides, Sw.	Chit.	......	
			......	Naga, Chin-H.		
Chilades ..	....	laius, Cr...	....	I. B. C.		
		trochilus, Frey.	....	N. I.-B.		I am not sure that I have got the distribution of trochilus and putli quite right.
			putli, Koll. ..	Centr. I. S. C.		
Zizera ..	....	maha, Koll.	....	N & Centr. I.-Up. B.	......	The arrangement of Zizera is more or less in accordance with Butter's revision (P.Z.S. 1900): in separating ossa I follow Swinhoe who states that its genitalia differ from those of maha. I am not sure that I have given the distribution of opalina, otis and indica correctly.
			ossa, Sw ..	S.		
			opalina, Pouj.	S. B.	=zera, Faw.: marginata, Pouj.	
		lysimon, Hub.	....	I. B. C. Ni.	? better as lysimon karsandra, M.	
		gaika, Fab.	....	I. B. C. An.		
		otis, Fab.	....	N. I.-B. An.		
			indica, Murray.	Centr, I.-S. C.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.,*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Everes ..	....	argiades ..	dipora, M.	N. I.-Up. B.	=diporides, Chp. argiades, Pall-Europe.	Dr. Chapman (T.E.S. 1908) states that argiades and parrhasius have different clasps and describes a third species, diporides, from Mandi (N.-W. Him). Swinhoe gives these 3 forms and also dipora as distinct species. Seitz only gives parrhasius as Indian.
			parrhasius, Fab.	S. C.		
		potanini, Alph.	....	S. B.		
		kala, DeN.	....	As.		
		moorei, Leech.	....	As.		There are a few specimens of E. moorei in the B.M. from the Khasi Hills (DeN. recorded it also, J.A.S.B. 1894) : the Assam form differs from Chinese specimens in being smaller and darker, also the spots below show distinctly through above. Seitz puts moorei in Lycæna; in appearance it is more like a Cyaniris or Chiladas.
Talicada ..	....	nyseus, Guér.	....	S. C.	......	
			khasiana, Sw.	As.-Up. B	= khasia Druce.	Burmese specimens of nyseus differ a good deal from S. Indian specimens but Khasi specimens seem very much the same.
Catachrysops-	....	strabo, Fab.	....	I. B. C. An. Ni.		In J.A.S.B. 1895 DeNicéville considered C. strabo and lithargyria to be separate species : Swinhoe keeps them separate.
		lithargyria, M.	....	As.-B. C. An.		
		pandava, Hors.	....	I. B. C.	......	
		cnejus, Fab.	....	I. B. C.		
Azanus ..	....	ubaldus, Cr.	....	I. B. C.		
		uranus, But.	....	I.	? d.s.f. of ubaldus.	
		jesous ..	gamra, Led..	I. B. C.	jesous, Guér, Africa.	
Tarucus ..	....	theophrastus, Fab.	....	I. C.		
			venosus, M.	N.-W. Him.	? worth separating.	
		plinius, Fab.	....	I. B- C.		
Castalius ..	....	rosimon, Fab.	....	I. B.C. An.-Ni.		
		ananda, DeN.	....	Sik.-B. S.		
		ethion, Db. and Hew.	....	As.-B. S. C.		
			airavati, Doh.	Ni.		
		roxus, God.	....	S. B. An.		
			roxana, DeN.	Up. B.		
			manluena Fd.	Ni.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Castalius —*contd.*	....	decidia, Hew.	....	Sik.-B. Centr. I. S-		
		elna, Hew.	....	Sik.-B. Oriss. An.		
Niphanda.	....	cymbia, DeN.	....	Sik.-As.		
			marcia, Few.	B.		
Orthomiella.	....	pontis, El.	....	Sik.-B.		
Lycænesthes.	....	emolus, God.	....	Sik.-B. Beng. N. Kan- An.	......	The representative of L. emolus in the Palni Hills is very distinct, and I propose to call it *topa*; it is smaller than emolus, the border is broader on the forewing; below the bands are filled in with darker colouring as in Nacaduba cœlestis, the markings are more regular, the discal band on the forewing is formed of almost separated spots, that in space 4 being transverse; the marginal lunules are prominent; the sub-anal ocellus is all black and there are 2 small black spots at the anal angle; the ciliated tails seem absent. I have one specimen and there is one specimen in the Bombay N. H. S. museum.
			topa, Ev. ..	Palni, H.		
Nacaduba,	....	lycænina, Fd.	....	Sik.-B. Beng. S C.		
		viola, M. ..	....	Sik.-B. S.C. An.		
		kerriana, Dist.	....	S. B.		
		macropthalma, Fd.	....	Sik.-B. S.C. An. Ni.	......	I have only seen macropthalma from Sikkim, Up. Burma; there seems to be a good deal of confusion between this species and pavana: the small andaman form of pavana is nearest the battered relics of Horsfield's types. The common S. Indian species of this type is nearer true pavana than to macropthalma. DeN. and Bing. do not give pavana from South India or Ceylon.
		pavana. Hors.	....	Sik.-B. S.C. An.	according to Swin. this is Felder's hermus.	
		bhutea, DeN.	....	Sik.-Up. B.		
			kodi, Ev. ..	Palni H.		
		ancyra, Fd.	....	As.-B. Ni.		
		dana, DeN.	....	Kum.-B. Beng.S.		
		hampsoni, DeN.	....	Muss. C. I. Nilgiris.		
		sivoka, Ev.	....	Sik. B. An.	There are specimens of this in the B. M. from Bhutan, Tenasserim and Malacca.	
		nora, Fd...	....	I. B. C.	adima, Rhé Phil. an ab.	I believe with various other writers that nora and noreia are separate species; nora, the tailed form, is often yellow below.
		noreia, Fd.	....	I. B. C.		
		coelestis, DeN.	....	Kum.-Up. B.-An.	=ardates, M.	
		atrata, Hors.	....	Sik.-B. S. C Ni.	=kurava, prominens, M.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Nacaduba —*contd.*	....	plumbeomicans, WM and DeN.	....	Sik.-S. C. An.	......	There seems a good deal of confusion between atrata and plumbeomicans; DeN. gave the latter from S. Burma and the Andamans; Swin. and Bing. extended the range to Sikkim. In S. India 2 species certainly occur and one seems to be plumbeomicans or a race of it. N. atrata was described from Java and prominens from Ceylon is certainly a synonym; the types of kurava seems to have disappeared.
			nicobarica, ..	Ni.		
Lampides ..	....	bochus, Cr.	....	I. B. C. An.	......	Swin. gives conferenda, But., as a separate species; I am convinced that it is only the dry season form of celeno.
			nicobarica, WM. and DeN.	Ni.		
		coruscans, M.	....	C.		
		lacteata, DeN.	....	C.		
		subdita, M.	....	Ten.		
		pura, M.	..	As.-B.	Swin.as cleodus.Fd.	L. cleodus is a Philippine insect; it is a different butterfly from pura but the forms may be conspecific.
		celeno, Cr.	....	I. B. C.	=conferenda, But.	
			kinkurka, Fd.	Ni.		
		cœrulea, Sw.	....	As.-B.	=bochides, DeN.	
		elpis, God.	....	I. B. C.		
			kankena, Fd.	Ni.	=rogersi, Bing.	
		kondulana. Fd.	....	Ni.		
Polyommatus.	....	boeticus, L.	....	I. B. C. An. Ni.		
LYCÆNIDÆ.		PORITIINÆ.				
Poritia ..	(Poritia).	hewitsoni. M.	....	Kum.-As.		
			tavoyana, Doh.	As.-B.	=geta, Faw.	
		sumatræ, Fd.	....	S. Ten.		
		pleurata, Hew.	....	S. B.		
		phraatica, Hew.	....	S. B.		
		erycinoides. Fd.	....	Up. B.		
	(Simiskina).	phalia, Hew.	....	Ten.		
		pediada, Hew.	....	Ten.		
		phalena, Hew.	....	As.-Up. B.	=harterti, Doh.	
Zarona ..	....	jasoda. DeN.	....	S. B.	=zanella, DeN.	
Cyanlroides	....	libna, Hew.	....	Mergui.	=(Logania) andersoni, M.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		CURETINÆ.				
Curetis ..	....	thetis, Drury.	....	S. C.	=? arcuata, M.	The forms of Curetis are puzzling. Of arcuata there is in the B M. only one male from Malabar, the locality may be wrong; the specimen resembles a small gloriosa. The races of thetis seem well defined; nicobarica female is very distinct, on the forewing there is a small dark yellow patch, on the hindwing a diffused white subcostal patch.
			gloriosa, M.	As.-M.		
			saronis, M.	An.		
			nicobarica Sw.	Ni.		
		bulis., Db. and Hew.	....	I. P.	......	C. bulis has not developed into definite races like thetis; malayica with a yellow female seems separate; angulata and discalis are well defined varieties. C. felderi is not Indian.
			(v. angulata, M.)	....	=dentata, stigmata, M.; sperthis. **Fd.**	
			(v. discalis, M.)	....		
			malayica, Fd.	Rangoon-Ten.		
		THECLINÆ.				
ephyrus..	....	khasia, DeN.	.....	As.		
		ataxus, Db. and Hew.	....	Murree-Kum.		
		duma, Hew.	....	Sik.-Naga Hill.		
		zoa. DeN.	....	Sik-Naga Hill.	......	Maj. Tytler at Manipur has recently obtained several specimens of Z. zoa: DeNiceville in his "Butterflies of Sikkim" considered the only specimen then known to be an aberration of duma. Z. mandara should, I think, be dropped; The only known specimens are in the United States; it may be an aberration of icana or dohertyi. Swinhoe substitutes Ruralis for Zephyrus and calls the subfamily Ruralinæ.
		letha, Wat.	....	Chin.		
		birupa, M.	....	Simla-Kum.		
		syla, Koll.	....	Chit.-Sik.	=triloka Hannyngton.	
		ziha, Hew.	....	Simla-Muss.		
		pavo, DeN.	....	Bhut.		
		icana, M.	....	Simla-Kum.		
		dohertyi, DeN.	....	Simla-Kum.		
Chætoprocta.	....	odata, Hew.	....	Chit.-Kum.		
Euaspa ..	....	milionia, Hew.	....	Murree-Kum.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		THECLINÆ—*contd.*				
Neolycæna.	....	sinensis, Alph.	....	Bal.		
Thecla ..	....	sassanides, Koll.	....	Bal.-Chit. Muss.		
Callophrys.	....	rubi, L. ..	.. .	Chit.		
Satsuma ..	....	leechii, DeN.	....	Khasi H.		
Ilerda ..	....	sena, Koll.	....	Chit.-Kum.		
		epicles, God.	....	Kum.-Up B.		
		kohimensis, Tytler.	....	Naga-H.		
		tamu, Koll.	....	Chit.-Kum.		
		viridipunctata, DeN.	....	Kum.-Sik.	......	Some Chinese specimens of viridipunctata are very like kala.
			kala, Tytler.	Naga-H.		
		androcles, God.	....	Kash.-Kum.	......	The Eastern form of androcles has the green colour of a conspicuously more brassy tint; I propose to call it *viridis*. I believe that moorei ought to be put as a race of androcles.
			viridis, Ev...	As.-Up. B.		
		moorei, Hew.	....	Sik.-Bhut.		
		brahma, M.	....	Kum.-Up.B.	=hybrida, Tyt., a cas ab.	
Chrysophanus.	....	phlæas, L.	....	Bal.-Chit.-Kum.	=timeus, Cr., stygianus, But.	
		pavana, Koll.	....	Kash.-Kum.		
		solskyi ..	aditya, M. ..	Chit.-Lad.		
		kasyapa, M.	.....	Chit.-Muss.		
		caspius ..	susanus, Sw.	Bal.	......	C. sarthus and transiens, Std., are races of caspius from Turkestan and the Pamirs.
			evansii, DeN.	Chit.		
		tseng, Ober.	....	Shan St.	=mandersi, El.	
Aphnæus ..	(Cigaritis)..	acamas ..	hypargyrus, But	Cutch.Bal.-Chit.	M....	In Palaearctic regions Aphnæus and Chrysophanus are closely allied.
	(Aphnæus).	vulcanus, Fab.	....	I		
			fusca, M. ..	C.	=minima, But., a cas ab and greeni Heron, a cas ab.	I think that all vulcanus like forms occurring in Ceylon should be regarded as fusca in Ceylon specimens the orange anal patch on the hindwing below is not extended upwards along the dorsal margin as in continental specimens.
		gabriel, Sw.	....	Up. B.	......	There is a good series of gabriel in the B. M.; it is quite a distinct form and represents vulcanus perhaps in Up. Burma.
		schistacea, M.	....	S.-C.		
		lilacinus, M.	....	U.P.-Malda, Bombay.		
			abnormis, M.	S.-C.		
		syama, Hors.	....	Sik.-B. Oris.	=peguana, M.	
		lohita, Hors.	....	Kum.-B. S. C.	=concanus, M.	
			zoilus, M. ..	S.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes*
LYCÆNIDÆ—*contd.*		THECLINÆ—*contd.*				
Aphnæus —*contd.*	(Aphnæus) —*contd.*	ictis, Hew.	....	I. C.	rukmini, DeN. an ab.	A. ictis is an extremely variable species and when more material becomes available I think separate races from the Western and Eastern Himalayas and South India might be established.
			maximus, El.	S. B.		
		nipalicus, M.	....	Muss. Nep.	=zaffra, DeN.	A. nipalicus is allied to lilacinus and schistacea; I have seen the type of nipalicus and have no doubt that zaffra is a synonym.
			sani, DeN. ..	Sik.-B.	rukma, DeN. an ab.	
		ARHOPALINÆ.				
Thaduka ..	....	multicaudata, M.	....	Ten. S.	......	Mr. Bethune Baker (T.Z.S. 1903) gave a revision of this subfamily and I have followed him; I have included the genera Zinaspa and Mota as they seem best placed here.
Mahathala.	(Mahathala).	ameria, Hew.	....	Beng. As.-B.		
	Apporosa).	atkinsoni, Hew.	....	Ten.		
Iraota ..	....	timoleon, stoll.	....	I. B.	=mæcenas, Fab.	I am not sure that the South Indian form of timoleon ought not to be called nicevillei.
			nicevillei, But.	C.		
		rochana, Hors.	....	Mergui.		
Amblypodia.	....	anita, Hew.	.. .	I. B. C. An.	=naradoides, M. arracana, Cr. S., erichsonii, W. M. and DeN.	I do not think it is worth while to separate anita into races.
			(female v. darana, M.)	S. C.		
		narada, Hors.	....	An. Mergui.	=taooana, andersoni, M.	
Surendra..	...	quercetorum, M.	....	I. B. An.	=biplagiata, But. tatimargo, M.	
			discalis, M.	C.		
		amisena, Hew.	....	Ten.		
		florimel, Doh.	....	Ten.	=stimula, DeN.	
Zinaspa ..	....	todara, M.	....	S.	These two are very close.	
			distorta, DeN.	Sik.-B.		
Mota ..	....	massyla, Hew.	....	Bhut.-B.		
Arhopala ..	....	meander ..	constanceæ, DeN.	An.	.....	Moore has divided the Arhopala group into several genera but their adoption as sub-genera even seems useless as the species run into one another in every direction; even the construction of a key presents great difficulty as whatever character is taken, *viz.*, tails, colour, spots on the underside it seems hopeless to define natural groups. I have not had time to study this genus as much as I should have liked; the material so far available is very scanty.

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ.—*contd.*		ARHOPALINAE—*contd.*				
Arhopala —*contd.*		centaurus, Feb.	....	E. Kum.-B.	=pirithous, M.	
			pirama, M.	S. C.	These seem worth separating.	
			coruscans, WM. & DeN.	An.		
		amantes, Hew.	....	I. C. An.		
			amatrix, DeN.	Up. As.-Up-B.		
		camdeo, M.	....	Sik.-B.		
		opalina, M.	....	As.	type seems unique.	
		bazaloides, Hew.	....	As.-B. S.	=bazalus, De N. nec., Hew.	
		albopunctata, Hew.	....	B.		
		alitæus. ..	mirabella, Doh.	Mergu.		
		mindanensis, B·B.	....	Mergui.		
		aida, DeN.	....	S.B.		
		vihara, Fd.	....	Up. Ten.		
		adorea, DeN.	....	Sik.-B.		
		dama, Sw.	....	Ten.		
		apha, DeN.	....	Ten.		
		adatha, Hew.	....	B.		
		silhetensis, Hew.	....	Sik.-B.	=arama, DeN.	
		nicevillei, B.B.	....	Sik..B.		
		anthelus. Db. & Hew.	....	Ten.		
		subfasciata, M.	....	Ten.		
		anarte, Hew.	....	Cach.-B.		
		agaba, Hew.	....	Naga H.-B.		
		zambra, Sw.	....	Ten.		
		selta, Hew.	....	Ten.		
		aroa, Hew.	....	Ten.		
		rafflesii, DeN.	....	Ten.	=pseudomuta, DeN. nec Hew. and amphimuta Dist. nec Fd.	
		atosia ..	aricia, Std...	Ten.		
		epimuta, M.	....	Ten.		
		moolaiana, M.	....	Ten.	=pastorella, Doh.	
		antimuta, Fd.	....	Ten.	=davisonii, DeN	
		hypomuta, Hew.	....	Ten.		
		metamuta, Hew.	....	Ten.		
		oberthuri, Std.	....	Ten.		
		alesia, Fd.	....	An. B.	=wimberleyi, DeN.	
		eumolphus, Cr.	....	Sik-As.	......	Bethune Baker unites all the races, of eumolphus; they are, however, very distinct.
			hellenore, Doh.	As.-B.	=viridissima, Sw.?	
			farquhari, Dist.	S. B.	=maxwelli, Dist.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		ARHOPALINÆ—*contd.*				
Arhopala —*contd.*	....	basiviridis, DeN.	....	B.		
		abseus, Hew.	....	Sik.-B. N. Kan. C.	......	The Burmese form of abseus may prove to be worth separating when more specimens are available ; it is near irregularis, Snell.
		diardi, Hew.	....	As.-B.		
		fulgida, Hew.	....	Sik.-Up. B.		
		anniella, Hew.	....	Ten,		
		artegal, Doh.	...	S. B.		
		apidanus, Cr.	....	B.		
			ahamus, Doh.	Up As.		
		adriana, DeN.	....	Sik.-Up B.		
		asoka, DeN.	....	Sik.-B.		
		chinensis, Fd.	....	Sik-Up. B.	=mœlleri, DeN. lazula, M.	
		areste, Hew.	....	Nep.-As.		
		bazalus, Hew.	....	Sik.-B.	=teesta. DeN. turbata, But.	
		singla, DeN.	....	Sik.-Up. B.		
		antura, Sw.	....	Ten.	very near vihara or adorea.	
		agrata, DeN.	....	S. B.		
		ædias, Hew.	....	B.		
		agnis, Fd.	....	B.		
		yendava, Gr. S.	....	B.	?=agnis, Fd.	
		khamti, Doh.	....	Up. As.		
		œnea, Hew.	...	Sik.-As.		
		rama, Koll.	....	Kash.-B.		
		atrax, Hew.	....	B.		
		hewitsoni, BB.	....	I. B.	=atrax Auct nec Hew.	
		alemon, DeN.	....	B.		
		canaraica, M.	....	S.		
		alea, Hew.	....	I.?	locality doubtful.	
		dodonæa, M.	....	Chit.-Kum.		
		comica, DeN.	....	Bhamo.	......	Bethune Baker places comica as a casual aberration of dodonæa, but as dodonæa has never been found east of Kumaon and comica was described from Burma this cannot possibly be the case.
		paramuta, DeN.	....	Nap.-B.		
		zeta, M. ..	....	An.		
		roona, M...	....	An.-Ten.	?=zeta, M.	
		agelastus, Hew.	....	Ten.	?=moolaiana M.	
		Sounguva, Gr. S.	....	B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ.—*contd.*		ARHOPALINÆ—*contd.*				
Arhopala. —*contd.*		perissa, Doh.	....	Ten.		
		asopia, Hew.	....	Ten.		
		aeeta, DeN.	....	Ten.	B.B. considers this to be an ab of asopia.	
		perimuta, M.	....	Sik.-B.		
		belphœbe, Doh.	....	As.-B.		
		duessa, Doh.	....	Ten.		
		ammonides, Doh.	....	Ten.		
		birmana, M.	....	S. B.	=arisba, DeN.	
		aberrans, DeN.	....	B.		
		paraganesa, DeN.	....	Kum.-Up.B.		
			zephyretta, Doh.	Up.-As.		
		ariel, Doh,	....	Up.-As.		
		ganesa, M.	....	Chit.-Kum.	......	Watson described a race of ganesa from the Chin Hills in J B. N. H. S. x, but gave it no name; I propose to call it *watsoni.* I think ganesa, dodonæa and rama ought to be placed together.
			watsoni, Ev.	Up. B.		
		arvina, Hew.	....	Ten.	=abœ, DeN.	
		adala, DeN.	....	Ten.	=adulans, DeN.	
		fulla, Hew.	....	An.		
		andamanica, W. M. & DeN-	....	An. Ten.	=subfasciata, M.	
		DEUDORIGINÆ.				
Zesius ..	....	chrysomallus, Hüb.	....	Malda. Centr. I., S. C.	I have a curious male ab, which is blue above instead of copper.	Bingham includes what I have called the Deudoriginæ with the Theclinæ. I am not sure that it would not be preferable to restrict Deudoriginæ for the first portion and place every thing from Thamala onwards in a new sub-family which might be called Myrininæ.
Deudoryx.	....	epijarbas, M.	....	I. B. C. An. Ni.		
		diara, Sw.	....	Jaintia H.		
		gaetulia, DeN.	....	As.-B.		
		hypargyria, El.	....	Karen, H.	Elwes placed this in Rapala but makes no mention of any secondary sexual characters.	
Hysudra ..	....	selira, M.	....	Chit.-Kum.		
Virachola..	....	hades, DeN.	....	Ten.		
		isocrates. Fab.	....	I. C.		
		perse, Hew.	....	I. C.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ.—*contd.*				
Virachola.—*contd.*	....	smilis, Hew.	....	An.		
Rapala ..	....	deliochus, Hew.	....	B.		
		tara, DeN.	..	kum,-As.	=francesia, Sw.	
		sphinx, Fab.	....	Syl.-B.	=nicevillei, Sw. a darker form.	
		scintilla, DeN.	....	Sik.		
		lankana, M.	....	S. C.		
		schistacea, M.	....	I. C.		
		abnormis, El.	....	Karen H.		
		buxaria, DeN.	....	Sik.-Up. B.		
		rosacea, DeN.	....	Sik.-As.		
		nissa, Koll.	....	Kash.-B.	=rectivitta, M. maculata, Seitz. subpurpurea, Leech.	
		ranta, Sw.	....	Jaintia, H.		
		varuna, Hors.	....	I. B. C. An.	=orseis, Hew. grisea and lazulina, M.	R rogersi is much larger than varuna; some specimens from Burma are equally large.
			rogersi, Sw.	Ni.		
		subguttata, El.	....	Karen, H..		
		refulgens, DeN.	....	Khasi H.-Nep.		
		petosiris, Hew.	....	Sik.-B. oriss.		
		suffusa, M.	....	Syl.-B.	=testa, Sw. barthema, Dist.	
		melampus, Cr.	....	I. C.		
		jarbas, Fab.	....	Sik.-B.	Seitz. as a race of melampus.	
		xenophon, Fab.	....	Beng. As.-B.	=dieneces, Hew. damona, Sw.	
			intermedia, Std.	An. Ni.		
Sinthusa ..	....	nasaka, Hors.	....	Kangra.-As.		
			amba, Kirby.	B.		
		chandrana, M.	....	Kum.-Up-B.		
		virgo, El...	....	Sik.-B.		
Listeria ..	....	dudgeoni, DeN.	....	Muss.-Bhut.	....	Listeria is rather a peculiar genus; I am not sure that it would not be better placed in the Theclinæ.
Dacalana ..	....	vidura ..	burmana, M.	S. B.		
Arrhenotrix.	....	penicilligera, DeN.	....	As.-B.		
Camena ..	(Camena) ..	cotys, Hew.	....	Nep.-B.		
		ctesia, Hew.	....	Kum.-As.		
		argentea, Aurivill.	....	Sik.-B.-S.	=cippus Auct, nec Fab.	
		icetas, Hew.	....	Dalhousie-B.		
		deva, M. ..	....	I.B. C.	=lila, M. (?race from N. I).	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, etc.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ—*contd.*				
Camena.—*contd.*	(Camena)—*contd.*	carmentalis, Den.	....	Sik.-B.	......	I think ister should be dropped, it seems to be a female aberration of cleobis. Swinhoe states that it is the female of what DeN. described as carmentalis; he may be right but the two insects are very dissimilar. I have a female ab of cleobis from the Nilgiris very similar to the type of ister in the B.M.
		icetoides, El.	....	Karen, H..		
	(Creon) ..	cleobis, God.	....	I.	=ister, Hew, ? a female ab.	
	(Maneca) ..	bhotea., M.	....	Sik.		
	(Creusa) ..	culta, DeN.	....	As.		
Ops ..	(Ops) ..	ogyges, DeN.	....	Ten.		
		oeta, DeN.	..	Ten.		
		melastigma, DeN.	....	Sik. B.-S.		
	(Britomartis).	cleoboides. El.	..	Sik-B.		
	(Bullis) ..	buto, DeN.	....	Ten.		
		valentia, Sw.	....	Khasi H.		
Tajuria ..	(Tajuria) ..	longinus. Fab.	....	I. B. C.	=cippus, Fab.	
		jehana, M.	....	I. C.		
		nela, Sw. ..	.....	Jaintia H.		
		diaeus, Hew.	.. .	Muss-As.		
		thyia, DeN.	....	Sik.-As.		
		albiplaga, DeN.	....	Sik.		
		tyro, DeN..	....	B.		
	(Remelana).	yajna, Doh.	....	Muss-Bhut.	=istroidea, DeN.	
		megistia, Hew.	....	As.		
		teza, Sw.	....	Jaintia H.		
		thria, DeN.	....	Ten.		
		donatana, DeN.	....	Ten.		
		mantra, Fd.	....	Ten.		
		jangala. ..	ravata, M. ..	Sik.-B.	jangala, Hors., Java.	
			andamanica, W.M. & DeN.	An.		
	(Cophanta).	illurgis, Hew.	....	Muss-B.	....	There are several specimens of luculenta, Leech (described from Omei Shan) in the B.M. from the Khasi Hills; it is very similar to illurgoides and may be a local race of the latter species; it differs in having a large extent of pale cœrulean blue above.
		illurgoides, DeN.	....	Kum.-Up. B.		
		luculenta, Leech.	....	Khasi		
		maculatus, Hew.	....	Sik.-B.S.		
		jalindra ..	indra, M. ..	Sik.-As. Beng. S.		
			tarpina, Hew	An.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ.—*contd.*				
Hypolycæna.	....	erylus, Gcd.	....	Sik.-B. An.	=andamana, M.	
		thecloides, Fd.	....	Ten. Ni.		
Chliaria ..	....	othona, Hew.	....	Muss.-B. S.		
		kina, Hew.	....	Muss.-B.	=cachara, M., an exact synonym.	
		nilgirica, M.	....	S. C.		
		merguia, Doh.	....	Ten.	=watsoni, Sw.	
Thamala ..	....	miniata, M.	....	B.		
Sithon ..	....	nedymond, Cr.	....	Ten.		
Araotes ..	....	lapithis, M.	....	Sik-B.		
Biduanda..	....	thesmia, Hew.	....	Ten.	=fabricia, M.	A number of different Biduandas are recorded from Tenasserim; there are only specimens of melisa and thesmia in the B. M.
		scudderii ..	....	Ten.		
		melisa, Hew.	....	Bhut.-B.		
		cyara, Hew.	....	Sik.		
		nicevillei, Doh.	....	Ten.		
Marmessus.	....	lysias, Fab.	....	B.	=boisduvalii, M.; moorei, Dist. is from the Malay Peninsula.	M. lysias is recorded from the Nicobars but DeNiceville considered it to have been an error.
Suasa	....	lisides, Hew.	....	As.-B.		
Neocheritra.		amrita, Fd.	....	S. B.		
		fabronia, Hew.	....	Sik.:Up.B.		
Manto ..		martina, Hew.	....	Ten.		
Eoxylides.		tharis, Hüb.	....	B.		
Cheritra ..		freja, Fab.	....	E.Kum.—B.	......	The Ceylon race of freja differs from jaffra only in size.
			jaffra, But. ..	S. C.	=? pseudojaffra M. Ceylon.	
Ticherra ..		acte, M. ..	....	E. Kulu-B.		
Cheritrella.		truncipennis, DeN.	...	Sik-B.		
Zeltus ..		etolus, Fab.	....	Sik-B. S.		
Bindahara		phocides, Fab.	....	Beng. As.-B. An.	=ines Sw. (Andamans).	
			areca, Fd. ..	Ni.	=kamorta, Fd.	
		sugriva ..	moorei, Fruh.	S. C.	sugriva, Hors, Java.	
Loxura ..		atymnus, Cr.	....	N. I. B. Ni.		
			surya, M. ..	S.		
			arcuata, M...	C.		
			prabha, M. ..	An.		
Yasoda ..		tripunctata, Hew.	....	Sik.-B.		
Ritra ..		aurea, Druce.	....	Ten.		
Neomyrina.		hiemalis, God. &Salv.	....	Ten.		
Drina ..		donina, Hew,	....	B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ—*contd.*				
Charana ..		mandarinus, Hew.	....	Sik.-B. An.		
			cepheis, DeN.	Cachar.		
Lehera ..	....	eryx, L. ..	....	Sik-B.		
		skinneri, W.M. and DeN.	....	Cachar-Khasi.		
Catapœcilma.	....	elegans, Druce.	....	Muss.-B.S.C.		
		subochracea, El.	....	Karen, H.		
		delicatum, DeN.	....	Sik.		
Rathinda..	....	amor, Fab..	....	As.-Oriss, S.C.		
Horaga ..	....	onyx, M. ..	....	Dalhousie-B. Oriss.		
			cingalensis, M.	S. C.		
		moulmeina, M.	....	Sik.-B	=sikkima, M.	H. moulmeina only differs from onyx in being ochreous below instead of dull brown.
		rana, DeN.	....	An.	=andamana, M.	
		viola, M. ..	....	Kangra-Sik. S.		
		albimacula, W. M. and DeN.	....	An.		
		LIPHYRINÆ.				
Liphyra ..	....	brassolis, Wd.	....	Sik. B.		
HESPERIIDÆ.		HESPERIINÆ.				
Orthopætus.	....	phanæus, Hew.	....	B.	......	The Hesperiidæ have been arranged in accordance with Elwes and Edwards revision (T.Z.S. 1897); the Ismeninæ have been separated as done by Mabille in the Macrolepidoptera. I have given a full synonomy.
		lalita, Doh.	....	B.		
		lidderdali, El.	....	Bhut.		
Capila ..	....	jayadeva, M.	....	Sik.-B.		
		zennara, M.	....	Sik.-B.	The S. Burma form differs slightly.	
Calliana ..	....	pieridoides, M.	....	Bhut-As.		
Crossiura..	....	pennicillatum, DeN.	....	As.		
Hantana ..	....	infernus, Fd.	....	C.		
Achalarus.	....	bifasciatus.	liliana, Atk..	As.B.	bifasciatus, Leech, China.	
			casyapa, M...	Kash-Kum.		
Charmion..	....	ficulnea, Hew.	....	B.	=signata Druce, leucographa, Pl.	
Celænorrhinus.	....	pero, DeN.	..	Kangra-As.		
		pulomaya, M.	....	Kangra-As.	=lucifera, Leech.	
		aspersa, Leech.	....	As.-B.	=clitus, DeN.	
		ambareesa, M.	....	Beng.-As.		
		flavocincta, DeN.	....	Bhut.		
		sumitra, M.	....	Sik.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ - *contd.*		HESPERIINÆ -- *contd.*				
Celænorrhinus. —*contd.*	....	pyrrha, DeN.	....	Kum.-B.	=patula, plagifera, DeN.: pluscula, Leech.	Pyrrha seems a good species, differing from sumitra in having prominent discal spots on the hindwing above; sumitra is a good deal larger and only bears a series of marginal spots on the hindwing.
		maculicornis, El. & Ed.	....	As.		
		leucocera, Koll.	....	I. B. An.	=putra, M., leucocicirca, El.	
		munda, M.	....	Kulu-Sik.		
		spilothyrus, Fd.	....	Sik.-S. C.	=ruficornis, Mab.? area, Plötz.	
		fusca, Hamp.	....	S.	......	C. fusca can easily be separated from spilothyrus by the chequered cilia.
		chamunda, M.	....	Sik.-Up. B.		
		nigricans, DeN.	....	Kulu.-B.		
		asmara, But.	....	As.-B.	=cacus, consertus, DeN.; goto, Mab. palajava, Std.	
		dhanada, M.	....	Muss. B.		
		andamanica, W.M. and DeN.	....	An. Ni.		
		zea, Sw. ..	....	Khasi H.		
		affinis, El. and Ed.	....	As.-B.		
		aurivittata, M.	....	As.-B.		
		badia, M...	....	Sik.-As.		
Cnaiolade	....	indrani, M.	....	Muss.-B	......	C. tissa is the plain form of indrani; some specimens of indrani from Burma are very pale.
			tissa, M.	.. Beng. Cetr. I.-S. C.	=lankae, Pl.	Sikkim specimens of dan are very light, but the species is extremely variable.
		dan, Fab...	....	Kash.-B. S.	=fatih, Koll; cacus. Lat.; dea. Leech; dichroa, Pl.	
		laxmi, DeN.	....	Sik.-B.		
		agni, DeN.	....	Sik.-B.		
		agnioides, El. & Ed.	....	As.		
		buchananii, DeN.	....	Up. B.		
		hamiltoni, DeN.	....	As.		
Tapena ..	....	thwaitesi, M.	....	Oriss.-B. C.		
		minuscula, El. & Ed.	....	B.		
		hampsoni, El. & Ed.	....	S.		
Ctenoptilum.	....	vasava, M.	....	Muss.- B.		
		multiguttata, DeN.	....	B.		
Odontoptilum.	....	angulata, Fd.	....	I.-B.	=sura. M.	
		pygela, Hew.	....	S.B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		HESPERIINÆ—*contd.*				
Caprona ..	...	ransonnettii, Fd.	....	I.-C.	=taylorii. DeN.	C. saraya is almost certainly a variety of taylorii the d.'s. f. of ransonnettii. I have specimens agreeing with saraya from the Dun. C. alida and ransonnettii seem to run into one another. There is a specimen in the B. M. marked ' kuki, Bing., Looshai Hills, to be described in part III Butterflies, Fauna of India "; until more specimens are obtained it should be regarded as an ab. of alida.
			alida, DeN...	Up.-B.	kuki, Bing., an ab.	
		syricthus, Fd.	....	I. B.	=agama, M., elwesii, Wat.	I have caught specimens of syricthus in the Palni Hills smaller than elwesii, Wat.
Tagiades ..	....	helferi, Fd.	....	Ni.	=noctis.	
			ravi, M. ..	Beng. Sik-B. An.	......	The form khasiana of ravi, with more or less white on the hindwing below is merely seasonal.
		alica, M. ..	....	Cash-As.-B. An.	=athos, Pl.; meetana, M.	The alica-gana group is rather confusing. T. alica was described from the Andamans and is inseparable from athos, Pl. from Sylhet; meetana, M. is from Tenasserim and is rather paler. T. distans (=? obscurus Mab, Java) was described from Calcutta and differs somewhat from alica, the translucent spots on the forewing are prominent and the upper black discal spot on the hindwing below is well separated from the lower spots and not in line with them. T. gana was described from Java and only differs from alica in having a large snow white area on the hindwing above. Indian specimens are smaller: there are in the B. M. specimens of gana from Ceylon, which ought, I suppose, to be referred to distans. I have placed alica distans and gana as separate species following Elwes but I think that they will eventually prove to be races of a single variable species.
		distans, M.	....	Beng. S. C.	=? obcurus, Mob.	
		gana, M. ..	....	Sik.-B.	=menanto, Pl.?	
		lavata, But.	....	Ten		
		atticus, Fab.	....	I. B. C. an.	=menaka, M.; calligana, But.; litigiosa, Mosch.	
		nana, El. & Ed.	....	As.-B.		
		dealbata, Dist.	....	As.-B.		
		trichoneura, Fd.	....	Syl.-B.	} doubtfully separate.	
		pralaya, M.	....	Sik.-B.		
		pinwilli, But.	....	As.-B.		
		tabrica, Hew.	....	Sik.	?race or ab of pinwilli-	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		HESPERIINÆ—*contd.*				
Satarupa ..	....	gopala, M..	....	Sik.-B.		
		bhagava, M.	....	Sik.-B. Oriss. S.		
			andamanica, W M & DeN.	An.		
		narada, M.	....	Sik. B.	=? diversa, Leech.	S. diversa is recorded from Assam; it is very near narada and may be the Chinese race; all the Assam specimens I have seen of this variable form are narada.
		phisara, M.	....	Sik.-B.		
		sambara, M.	....	Sik.-As.	=corinna, Pl.	
			dohertyi, Wat.	Muss. Kum.		
			affinis, Druce.	B.	=cognata, Druce and? niphetes, Weymer.	
Odina ..	....	decoratus, Hew.	....	Syl.-B.		
		ortygia, DeN.	....	Ten.		
Darpa ..	....	hanria, M.	....	Muss.-As.		
Sarangesa.	....	purendra, M.	....	Kulu-Kum. Centr. I-S.		
		sati, DeN.	....	Cutch. C.P.?		
		dasahara, M.	....	Kangra.-B. Centr. S.		
		albicilia, M.	....	C.	=sezendis, Pl.	
Carcharodus.	....	altheæ, Hüb.	....	Bal.:Chit.	=marrubii, H.S.; boeticus, Ramb.	
		alceæ, Esp.	....	Bal.-Chit.-Kash.	=malvarum, God.; dravira, M.; swinhoei, Wat.	
Hesperia ..	....	galba, Fab.	....	I. B. S.	=superna, M.; evanidus, But.	H. evanidus does not seem separate from galba; : zebra seems quite distinct.
		zebra, But.	....	Punjab.	=hellas, DeN.; nanus, Trimen.	
		orbifer, Hub.	....	Chit.	......	Chitral specimens of orbifer are near lugens, Std., Thian Shan, a variety not given in Elwes and Edwards: the species is extremely variable and runs into sao Berg.
		phlomidis.	geron, Wat ..	Bal.	phlomidis, H. S., Asia Minor.	
		poggei, Led.	....	Bal.		
		alpina, Ersch.	....	Chit.	......	Typical alpina occurs in Chitral; Kashmir specimens have all the markings very reduced; the two forms were both described in 1874.
			cashmirensis, M.	Kash.-Kum.	=durwazica, Cr.	
Thanaos ..	....	marloyi, Bdl.	....	Chit.	......	Chitral specimens of marloyi are much darker than those in the B. M. from other localities.
Gomalia ..	....	albofasciata, M.	....	Kangra-S. C. Bal. Sind;	=littoralis, Swin.	

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ – *contd.*		PAMPHILINÆ.				
Pamphila..	....	avanti, DeN.	....	Kum.Sik.		
		dieckmanni, Græser.	....	As.-Up. B.	=demea, Ober.; gemmatus, Leech.	
Baracus ..	....	vittatus, Fd.	....	C.		
		subditus, M.	....	S.		
			Septentrionum, WM. & DeN.	Sik.-B.	......	The so called septentrionum recorded from the Nilgiris is really the d. s. f. of subditus.
		hampsoni, El. & Ed.	....	S.		
Sancus ..	....	pulligo, Mab.	....	Cach.-B.S.	=ulunda, forensis, kethra, Pl.; subfasciata, M.	
Astictopterus.	....	olivascens, M.	....	Kum-B. Beng. S.	=chinensis, Leech; melania, Pl.	A. jama, Fd., Sumatra, is a very obscure form; Felder compared it with Aeromachus indistincta and the female type is said to=koruthaialos butleri female.
		henrici, Bdl.	....	As.-B.	=kada, Sw. ? nubilus, Mab.	
Koruthaialos.	....	xanites, But.	....	B.		
		rubecola, Plötz.	....	Naga B. ..	=hector, Wat.; gemmifer, But.; palawites, Std.	
		butleri, WM. & DeN.	....	Sik.-B.		
Suada ..	....	swerga, DeN.	....	Sik.-B.		
Suastus ..	....	gremius, Fab.	....	I. B. C.	=raika, Pl.; subgrisea and divodasa, N.; robsonii, DeN., an ab.	Robsonii is merely a starved aberration of gremius; I have a specimen from Jabalpur and two dwarfed specimens of gremius (also from Jabalpur) rather near robsonii.
		aditus, M.	....	Sik.-B. Beng.-An.	=sala, El. and Ed.; nec, Hew.	S. aditus is usually put as a synonym of sala, Hew.; sala is, however, a very different form and put here under Pedestes.
		bipunctus, Sw.	....	S.		
		minuta, M.	....	C.	=sinhalus, Pl.;	
Taractrocera.	....	maevius, Fab.	....	I. B.	=flaccus, Fab.; sagara, M.	The Ceylon form of maevius has not the veins on the hindwing below conspicuously pale as in continental specimens.
		danna, M..	....	Simla.-As.		
	....	ceramas, Hew.	....	S.	=silhetica, Pl.	
			nicevillei, Wat.	Bombay ..	=coras, Auct; nac, Cr.	
			oberthuri, El. & Ed.	Trichinopoly-Animalai H.		
		atropunctata, Wat.	....	Up. B.		
		archias, Fd.	....	Ten.	......	T. archias is rather like A. maro above, and below like T. dara.
		ziclea, Pl..	....	B.	=mæsoides, Std.; luzonensis, Mab.	T. ziclea is exactly like small specimens of T. dara that have no black spotting below; the only difference is the antennæ which in ziclea have a spatulate club, yellow coloured below; in dara the club is all black and has a terminal crook.
Ampittia ..	....	maro, Fab.	....	I. B. C.	dioscoroides, Fab.; camerta, M.; lynx, Mösch; palemonides, Pl.	
		maroides, DeN.	....	Ten.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Jambrix ..	....	salsala, M.	....	Sik.-B. S.C.	=luteipalpis, Pl.	
		stellifer, But.	....	B.		
Ochus ..	....	subvittatus, M.	....	Kum.-Up.B.	=subradiatus, M.	
Aeromachus.	....	stigmata, M.	....	Kangra-As.	....	There are practically no specimens of Aeromachus in the B. M. collection.
		discreta, Pl.	....	As.-B.		
		jhora, DeN.	....	Sik.-B.		
		dubius, El. & Ed.	....	S.		
		indistincta, M.	....	B.-S.	=pygmæa, M.	
		obsoleta, M.	....	As.		
		kali, DeN..	....	Sik.-B.		
Sebastonyma.	....	dolopia, Hew.	....	Sik.-B.		
Pedestes ..	....	masuriensis, M.	....	Muss.-Sik.		
		pandita, DeN.	....	Sik.-As.		
		sala, Hew.	....	Cachar.-B. S.	=submaculata, Std.	I was always under the impression that sala was the same species as aditus, but on examining Hewitson's type I found it to be what has usually been called submaculata; sala was described in Suastus, Elwes and Edwards placed submaculata in Plastingia and DeNiceville put the latter in Pedestes in his list of the N. Kanara butterflies. I defer to DeNiceville's opinion but in general appearance sala is very like Suastus gremius: it can be easily distinguished from gremius by the spotted apex of the forewing below.
Isma ..	....	protoclea, Hs.	....	S. B.	=iapis, DeN.	
Hyarotis ..	....	adrastus, Cr.	....	I. B. C.	=praba, M.; phœnicis, Hew.	
Arnetta ..	....	vindhiana, M.	....	Centr. I. S.	=nilgiriana, modesta, M.	
		atkinsoni, M.	....	Sik.-B.	=subtestaceus, khasianus, M.	
		binghami, Sw.	....	S. B.		
Itys ..	....	microstictum, WM. & DeN.	....	Cachar.		
Zographetus.	....	satwa, DeN.	....	Kum.-B.		
		flavalum, DeN.	....	Sik.		
		ogygia, Hew.	....	Sik.-B. S. An.	=flavipennis, DeN, d. s. f.	
		maculicornis, El. & Ed.	....	B.	? very near if not= P. sala, Hew.	
Scobura ..	....	phiditia, Hew.	....	B.	=martini, El. and Ed.	S. phiditia is usually placed in Suastus, but as it is generally believed to be the male of Scobura martini, I think it is better placed here.
		cephala, Hew.	....	Sik.-B.	=isota, Sw.	
		cephaloides, DeN.	....	As.-B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms; &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Acerbas ..	....	anthea, Hew.	....	Ten.	=tagiadoides, Mab.	
Erionota ..	....	thrax, L. ..	....	Dun.-B.	=lara, Sw.	E. acroleuca is given from Assam to Burma as well as from the Andamans, but continental specimens differ somewhat and are best regarded as small varieties of thrax.
			acroleuca, WM. & DeN.	An.	=hiraca, M.	
		batara, M.	....	B.	=attina, M; latreillei, Fd; cruda, HS.; anitta, Pl.	E. batara was formerly placed in a separate genus, Unkana.
Pudicitia .	....	pholus, DeN.	....	Bhut.-As.		
Gangara ..	....	thyrsis, Fab.	....	Sik.-B. Beng.-S. C.	=pandia, M.	
Paduka ..	...	lebadea, Hew.	....	Sik.-B. C. An.	=glandulosa, Dist.; subfasciata, M.; andamanica, WM. & DeN.	
Matapa ..	....	aria, M. ..	....	I. B. C. An.		
		purpurascens, El. & Ed.	....	As.-B.		
		druna, M...	....	Sik.-B. An.	=pulla, Pl.	
		sasivarna, M.	....	Sik.-B.		
		shalgrama, DeN.	....	Sik.-B.		
Kerana ..	....	diocles, M.	....	Kum.-B.		
Stimula ..	....	swinhoei, El. & Ed.	....	As.-B.	......	S. swinhoei was first put in the genus Watsonia but the latter name was found to be preoccupied.
Pirdana ..	....	hyela ..	rudolphii, El. & DeN.	Sik.-B.	hyela, Hew.; Malay Penin.	
		distanti, Std.	....	B.	=pavona, DeN.	
Plastingia.	..	callineura, Fd.	....	B.		
		margherita, DeN.	....	As.-B.	? a race of callineura.	
		corissa, Hew.	....	Ten.	=drancus, Pl.; latonia, Std.; indrasana, El. & DeN.	
		noemi, DeN.	....	Sik.-B.		
		naga, DeN.	....	As-B.	=? tessellata, Hew.	
		idyalis, DeN.	....	S.B.	Placed by DeN. in Isma.	
Lotongus ..	....	calathus, Hew.	..	S.B	=maculatus, Dist.; parthenope, Weym.; aliena, Std.; zalates, sarus, Mab.; traviata, Pl.	
		zeus, DeN.	...	As.-B.		
		avesta, Hew.	....	B.	tamiata, Std.	
		sarala, DeN.	....	As.		
Creteus ..	....	cyrina, Hew.	....	Sik.-B	=parca, DeN.; meleagrina, Std.	
Zea ..	....	taprobanus, Pl.	....	? C.	=mythecoides DeN.	
Hidari ..		irava, M. ..	....	B.	=hypœpa, Hew.	
		bhawani, DeN.	...	B.		

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Pithauria.	....	murdava M.	....	Sik.-B.	I have a spotless ab. of this.	
		stramineipennis, WM. & DeN.	....	Sik.-B.		
		aitchisonii, WM.&DeN.	....	Cachar.-B.	=glauca, Std.	
Oerane ..	....	neæra, DeN.	....	S.-B.		
Notocrypta.	....	feisthamelii, Bdl.	....	I.B.C.	=curvifascia, Fd. alysos, albifascia, restricta, M.; volux, Mab.; clavata, Std.; rectifascia, Leech; varians, Maas.; chimaera, Pl.	N. restricta is often regarded as a different species from feisthamelii but I think they should be united.
		paralysos, WM. & DeN.	....	An.	? a race of feisthamelii.	
		basiflava, DeN.	....	S.		
		monteithii, WM. & DeN.	....	cachar.-B.	=singularis, Mab.	
Udaspes ..	....	folus, Cr.	....	I.B.C.		
Actinor ..	....	radians, M.	.....	Chit.-Dun.		
Cupitha ..	....	purrea, M..	....	Sik.-B. Oriss. S.An.	=tympanifera, M.; lycorias, Mab.	
Augiades ..	....	subhyalina, Br. & Gr.	....	As.		
		siva, M. ..	....	As.-B.		
		brahma, M.	....	Muss.-Kum.	? a race of siva.	
Telicota ..	(Telicota)..	augias, L..	....	I. B. An.	......	I have here followed Elwes as regards the synonymy of dara but with considerable doubt; De Niceville and Watson both placed mæsoides and pseudh mæsa as separate species occurring with dara. Kollars type specimen came presumably from the W. Himalayas, and is probably exactly the same as mæsa M., Kunawur, the small pale form, pale yellow below spotted with black. T. pseudomæsa is from Ceylon and is very like dara differing only in being a dark yellow orange below; it may be a race of dara but is not a distinct species. T. mæsoides was described from a Malacca specimen in poor condition with no antennæ it is like dara but darker, below it is dark yellowish red and the marks are not defined with black; there are similar specimens from South Burma in the B. M. I have not seen the types of the other "species" described. In the B. M. and in my own collection two forms stand out, a small form agreeing with the types mentioned and a large form whose name I do not know, but at present I do not see my way to do anything than consider all the Indian specimens as belonging to dara.
		bambusæ, M.	....	I. B. C.	=pythias, Mab.	
		palmarum, M.	....	Beng.-B. An.-Ni.	=chrysozona, Pl.	
	(Padraona).	concinna, El. & Ed.	....	S.		
		gola, M. ..	....	Sik.-B. Oriss. S. C. An.	=goloides, M.; akar, Mab.; locus, alfurus, fabriolata, Pl.	
		rectifasciata, El. & Ed.	....	Sik.-B.		
		dara, Koll.	....	I. B. C. An.	=mæsa, M.; mæsoides, pseudomæsa, But.; hataerus, Semp.; sunias, Fd.; flava, nitida, taxilus, trachala, zebra, Mab.; nala, zatilla, Pl.	

Genus.	*Sub-genus*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Halpe ..	..	zema, Hew.	....	Sik.-B.	=ormenes, Pl.	
		cerata, Hew.	....	Sik.-B.		
		astigmata, Sw.	....	S.		
		hyrie, DeN.	....	Bhut-As.		
		kumara, DeN.	....	Sik.-Bhut.		
		knyvetti, El. & Ed.	....	Sik.		
		moorei, Wat.	....	Muss.-B.	=teliga, Sw.	H. moorei is probably a race of ceylonica.
		ceylonica, M.	....	Beng.-S.An. Oriss.-S.C.		
		homolea, Hew.	....	Sik.-B.	=marta, aucma, Sw.; palawea, Serup.	
		sikkima, M.	....	Sik.-As.	=wantona & perara, Sw.	H. sikkima with its unchequered cilia is different to homolea: the Assam form (wantona) seems rather smaller.
		hyrtacus, DeN.	....	S.	......	There are some specimens belonging to Halpe in the B. M. from Ceylon and South Burma which belong to undesoribed species but being only single specimens I do not think that they ought to be described until more are obtained.
		egena, Fd.	....	C.	=brunnea, Pl.	
		fusca, El ..	....	B.		
		sitala DeN.	....	S.		
		evershedi, Ev.	....	Palni H.		
		gupta, DeN.	....	Garhwal. As.		
		debilis, El. & Ed.	....	As.		
		aina, DeN.	....	Garhwal. As.		
		separata, M.	....	Kum. As.		
		albipectus, DeN.	....	Shan St.		
		masoni, M.	....	B.		
		honorei, DeN.	....	S.		
		decorata, M.	....	C.		
		ornata, Fd.	....	Cachar.		
Onryza ..	....	meiktila, DeN.	....	B.		
Iton ..	....	watsoni, DeN.	....	B.		
		semamora, M.	....	Sik.-B.	=barea, Hew.	
Parnara ..	(Baoris) ..	oceia, Hew.	....	Sik.-B. Beng Centr. I. C. An.	=farri, penicillata, scopulifera, M.; sikkima, Sw.; unicolor, M.	
	(Milena) ..	plebeia, DeN.	.....	Muss.-B. Oriss. S.	=mormo, Mab.	Plebeia, the only Parnara with a tuft of hair on the underside of the forewing deserves to be placed in a separate subgenus for which I propose the name *Milena*. Swinhoe's Caltoris does not seem worth retaining.

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*	PAMPHILINÆ—*contd.*					
Parnara. —*contd.*	(Chapra) ..	brunnea, Snell.	....	B.	=cœre, DeN.; sodalis, Mab.	
		prominens, M.	....	Kangra.-B. Centr. I. S.	=midea, Walker; sinensis, Mab.; similis, Leech.	
		mathias, Fab.	....	I. B. C. An.	=thrax-Led; julianus Lat; larika, Pag; agna, subochracea, chaya, M., balarama, ella. Pl.	
	(Parnara)	philippina, HS.	....	S. C.	=seriata, M.	P. philippina and kumara are very close to one another; their genitalia were found to be different by Elwes and Edwards.
		kumara, M.	....	Sik. B. Beng.-S.C.	=saruna, Pl.	
		canaraica, M.	....	S.	......	P. canaraica seems to be the only member of this group with spots on the hindwing below; the type female in the B.M. really belongs to conjuncta I think.
		auirociliata, El. & Ed.	....	Sik.		
		pagana, DeN.	....	Sik.B.Beng-	......	The group pagana—cahira, all flying together, are difficult to recognise; pagana has a spot in ♂ on the forewing; cahira on the forewing below has a suffused black discal patch; moolata is very like austeni, the former is deep warm brown below and the latter dark chestnut.
		moolata, M.	....	As.-B.	=dravida, Mab., female onchisa. Sw.	
		austeni, M.	....	Sik.-B.S.C. An.	=male onchisa, Sw.	
		cahira, M.	....	B.-An.		
		toona, M...	...	Kum.-B. S.	scortea, contigua (?), Mab.; Kolantus, Pl.; pellucida, Mur.?	The Assam form of toona has whiter spots, rather like pellucida, the Chinese race.
		eltola, Hew.	....	Kangra.-B.		
		discreta, El. & Ed.	....	Sik.-B.	......	P. contigua, Mab. was put as a synonym of toona by Elwes but the specimens arranged over this name in the B.M. are the Javan form of conjuncta.
		guttatus, Br. & Gr.	....	Chit.-As.	=sifa, wambo, nandoa, Pl.; mangala, M.; fortunei, H.S.	
		bada, M. ..	....	I. B. C.	philotas, DeN, an ab.=haga, Pl. intermedia, H. S.	
		colaca, M..	....	I. B. C. An. Ni.	=ciingala, M.; urejus, Pl.	
		bevani, M.	....	I. B.	=? flexilis, Sw.; thyone, Leech.	
		assamensis, WM. & DeN.	....	Muss.-As.	=abie, Pl.	
		conjuncta, HS.	....	I. B. C. An.	javana, Mab.; narooa, M.; alica, Pl.	
		uma, DeN.	....	B.	I have not seen this.	
		tulsi, DeN.	....	Sik.-Up.B.	=jolando, Pl.	

Genus	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Eogenes ..	....	alcides ..	lesliei, El. ..	Chit.	......	In the B.M. there are several specimens, caught by me in Chitral, placed as Arnetta lesliei, El.; they are, however, very close to Eogenes alcides, differing in being darker, rarely having any cell spot in 1a on the forewing and in often having a discal spot on the hindwing below.
Gegenes ..	....	nostrodamus, Fab.	....	Bil.-Chit.-Dun. Panj.	=pumilio Hoff.; lefebrii, Kumb. pygmaeus, Hüb.: karsana, M.	
Erynnis ..	....	comma ..	dimila, M. ..	Chit.-Muss.	......	Ladak specimens of dimila are very pale.
		ISMENINÆ.				
Ismena ..	..	ataphus, Wat.	....	Kangra-B. C.	=consobrina, Pl.; ? œdipodea, M.	I. ædepodea from Java has the body and bases of the wings above sprinkled with metallic blue green scales.
		tuckeri, El. & Ed.	....	Ten.		
		mahintha, M.	....	Cachar-B.		
		jaina, M. ..	......	Muss.-B.		
			fergusonii, DeN.	S.		
		etelka, Hew.	....	B.		
		harisa, M..	....	Sik.-B.		
		anadi, DeN.	....	Muss.-As.		
		vasutana, M.	....	Kum.-As.		
		amara, M..	.. .	Sik.-Up. B.		
		gomata, M.	....	Sik.-S.	lorquinii, Mab.	
Rhopalocampta.	...	benjaminii, Guer.	....	Kangra-B. S. C.	......	Mackinnon in Mussoorie found that R. benjaminii has 2 forms of larva and Elwes (P.Z. S. 1891) pointed out that there seemed to be 2 forms of the imago, one with the green colour confined to the base, and the other green all over; this difference appears to be merely sexual and no further evidence seems forthcoming as to whether there are one or two species under this name.
		crawfurdi, Dist.	....	Ten.	=electra, Std.	
Badamia ..	....	exclamationis, Fab.	....	I. B. C. An. Ni.	=ladon, Cr., thymbron, Fd.	
Bibasis ..	....	sena, M.	....	I. B. C.		
Hasora ..	....	chuza, Hew.	....	As.-B.		
		coulteri, WM & DeN.	....	Cachar.		
		chabrona Pl.	....	Sik.-B. S.		
		butleri, Aurivill.	....	I. B. C.	chromus, Auct, nec, Cr.	
			malayana, Fd.	An.-Ni.		
		chromus, Cr.	....	B. S. C.	alexis, M.	
		simplicissima, M. ab.	....	B.	=philetas, Pl.	
		anura, DeN.	....	Sik.-As.		
		badra, M.	....	Sik.-B.S.C.	quadripunctata, Mab.	

Postscript.

During a recent visit to Calcutta, I had an opportunity of examining the DeNicéville's collection and would like to make the following notes :—

Neptis melba.—There is a single specimen of this species in DeNicéville's collection labelled by him "*Neptis nyctea*, female type." I have examined the genitalia of my two specimens and find that they are both males. I believe DeNicéville's specimen is also a *melba*. The genitalia of *melba* differ from those of *narayana*, and *manasa* (= *nyctea*). In this connection it may be remarked that Oberthür, in "Etudes," 1906 (October), states that he has eleven specimens of *nyctea* and three of *manasa* from Sikkim: he considers that *nyctea* is a white marked race of *thisbe*, Leech (China) and that *manasa* is distinct species, the Chinese form of which he describes as *narcissina*.

Melitæa trivia mixta.—DeNicéville has labelled the specimens of this race, that I sent him, as "*mercea*, DeNicéville," but I do not think that he ever published a description of *mercea*.

Lycæna devanica gracilis.—Similarly DeNicéville has labelled this "*lysias*," but I have seen no description.

The range of *Dilipa morgiana* is given as ' Kulu.—Up. B ", it should be " Murree—Up. B". Also the range of *Dodona egeon* should be " Kash—B " instead of " Kash.—As."

Errata in Part I.

P. 561, near top, " camaralzaman, But. and " crameri " to be shifted up one line : " crameri " should be opposite " bremeri."

P. 563, line 9, for " Philareta " read " Philarcta."

P. 564, line 6 from end, for " bolancica " read " bolanica."

P. 566, line 5, " drypetis, Hew.," to be shifted down one line, so as to be in the same line as " .. S. Oriss."

P. 570, line 13 from end, for " diadernoides " read diademoides."

P. 571, line 18, for " Croweay " read " Crowley."

P. 574, lines 7 and 8 from end, omit " eleanor, Fruh. S.B." and " pardalis, M. Mergui."

P. 577, line 4 from end, " columella, Cr." to be shifted down one line so as to be in the same line as " Dun—Up. B "

P. 578, line 7, " harita, M." to be shifted down one line so as to be in the same line as " E. Beng—B."

P. 573, line 10, " anjana, M." to be shifted to the left into the "species" column.

P. 578, line 9 from end, omit " ananta, M. . . . Chamba—B."

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVIII with Plate XVIII, Diagram and Map.

(Continued from page 475 of this Volume.)

The genus *Helicops* is one of many into which aglyphous colubrines, *i.e.*, colubrines without grooved or tubular teeth either in the front or back of the maxilla, are divided. It contains eleven species, which inhabit South Asia, Tropical Africa, and North and South America, but only one of these, *viz.*, *schistosus* occurs within Indian limits. The type is the Brazilian *H. carinicauda*.

HELICOPS SCHISTOSUS (Daudin).

THE OLIVACEOUS KEELBACK.

Our first introduction to this snake is through Russell who figured, and remarked upon it in 1801.*

Nomenclature (a) Scientific.—The generic name for which Wagler is responsible, dates back to 1830, and is from the Greek "elis," rolling, and "ops," eye, and seems to me specially suitable to our Indian representative, for I do not think I have ever observed another snake move its eyeballs so actively. The specific title given by Daudin in 1803 from the Latin meaning "slaty", was probably suggested by the dorsal colour of Russell's plate, or a spirit specimen. It is to my mind not appropriate, for in life the snake is olivaceous.

English.—The olivaceous Keelback seems to me a suitable name.

Vernacular.—Russell says it is known to the natives (on the Coromandel coast?) as "Chittee" which I am told is Telugu for little, and "Nalla wahlagillee pam." In Mysore it is known by the Canarese name "Barmnya."

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* Ind. Serp., Vol. II, Plate IV.

General characters.—The head is chiefly remarkable for its short, and rather pointed muzzle. The shields are glossy. The nostril is slit-like and placed rather high, distinctly approaching the type seen in the true water snakes of the Family *Homalopsinæ*. It occupies about half the depth of the nasal shield, which is divided below it by a suture running to the 1st supralabial. The eye is lateral in its setting, rather small, the pupil round, and the iris speckled throughout with gold. The commissure of the mouth viewed in profile is seen to take a sudden bend upwards behind the eye. The tongue is plum-coloured. The neck is not very evident. The body is rather stout for the length of the snake, and the scales on the back are sharply ridged as in other Keelbacks. The tail is long, its relative length being nearly one-third the total length in males, but nearer one-fourth in females.

Dimensions.—My largest specimen is a ♀ measuring 2 feet $10\frac{1}{4}$ inches. Females attain a greater length than males, and I have had 7 measuring over 2 feet, but never a ♂ reaching this length. The average length of my 7 largest females is 2 feet $4\frac{3}{4}$ inches and that for my 7 largest males only 1 foot 10 inches.

Identification.—In colouring and general appearance it may be very easily confused with the water snake *Hypsirhina enhydris*, but bears a still more striking resemblance to *Rhabdops bicolor*. It is rather remarkable too that all these three snakes possess but a single internasal shield, a rare feature in lepidosis. If the lepidosis is studied its identification from all Indian snakes is easy. Three characters must coexist, and these are (1) a single internasal, (2) 19 costal rows in midbody, and 17 at a point two headslengths before the vent, and (3) 8 or 9 supralabials. The combination of the 1st and 2nd of these is only seen in two other Indian snakes, *viz.*, *Cantoria violacea* and *Hypsirhina plumbea* which have respectively but 4 and 5 supralabials.

Colour.—Though Boulenger says it is dorsally olive-brown, all the many specimens I have seen in life have been olive-green. This hue is uniform on the upper parts of the head, body and tail in adults, and abruptly ceases in the middle of the penultimate row. Boulenger * says there is usually a more or less distinct dark lateral streak, and some specimens have two series of small black spots along the back, but I have never noted these. Günther† says that the young have a blackish streak from the orbit, continued along the fore part of the body. The lower half of the penultimate row of scales, the ultimate and the under parts of the snake are uniform yellow, sometimes of a very bright hue. Sometimes there is a pinkish or lilac suffusion on the penultimate and ultimate rows. The head is uniform olivaceous above, merging to yellow on the lips, and usually has no streaks from the orbit, nor on the labials.

A very distinct variety occurs in South India which bears a narrow reddish line down the back on the confines of the 5th and 6th rows above the ventrals where the scales are 19, and the 4th and 5th where 17. This line disappears at the vent and I have noted is more vivid in males than females. I have never seen this in specimens from the Ganges Basin (Fyzabad).

Disposition.—Though Cantor‡ remarks that the species is very fierce, and Ferguson§ quotes Ingleby's words to the same effect, I have invariably found it very much the reverse, in fact I know of no Indian snake with a more inoffensive nature and nicer manners. I am not courageous where snakes are concerned, and object strongly to being bitten even by species that I know to be harmless, so I am always chary of handling them, but this species like the buff-striped Keelback (*Tropidonotus stolatus*) is so remarkably gentle that I pick it up fearlessly and have never been struck at, or bitten. When alarmed the snake will erect itself and flatten the neck like all other Keelbacks, and it may have been this behaviour that led the writers named above to suppose it fierce. Even the two I had conjoined in Bangalore permitted my handling them and making close investigations, without resenting my interference further than to try and elude my grasp. This placid nature is by no means associated with a lack of spirit, for the little reptile is as vivacious, active in movement and alert as any snake I know.

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* Cat. 1893 Vol. 1, p. 274.

† Rept. Brit. Ind. 1864, p. 273.

‡ P. Z. S. 1839, p. 54.

§ Bomb. N. H. Jourl., Vol. X, p. 73.

Haunts.—The olivaceous Keelback exhibits a strong taste for an aquatic environment, and the position and character of its nostrils conforming to the type seen in the true fresh water snakes (*Homalopsinæ*) in itself proclaims the snake a water snake by habit. In Fyzabad I got no specimen during 19 months' residence, but when the river overflowed its banks and flooded the country for miles in August 1906, I had 8 specimens brought to me in 14 days, all from the inundated area. It by no means haunts rivers to the exclusion of jheels and similar collections of water, nor does it show a greater liking for flowing water, for in Bangalore where it was very common it was found haunting the small collections of water in the Lal Bagh, and other similar pools, elsewhere. The snakemen there denied that it was a watersnake, and said they never found it actually in the water, but at the edge of the pools where the dank soil favoured a luxuriant growth. They also frequently encountered it in the foliage, and lying along the stems of the bamboo brush near the water. In the rains I think it leaves the vicinity of pools, and wanders further afield, there being abundant moisture in the grass and weeds that spring up everywhere. I have met with it in the grass at some distance from water during the monsoon, and remember capturing one which crossed the pitch at Berhampur while a cricket match was in progress on the parade ground. Ferguson remarks that one he had in captivity in Trivandrum was never seen to enter the chatty of water provided for it and Mr. Ingleby mentions that a caged specimen he had invariably buried itself in the sand at the bottom of its cage with nothing but the extremity of its head and its eyes sticking out.

Habits.—*Schistosus* evinces a markedly diurnal habit being frequently encountered in daylight in the haunts it favours. It is probable that with such pronounced aquatic tastes, it is forced to retire for many months in the year. All the specimens I can recall were about during the rainy season of the year.

I have already alluded to the attitude it adopts when alarmed, a posture very typical of the Keelbacks of many genera including *Tropidonotus*, *Pseudoxenodon* and *Macropisthodon*. The neck in this species is very markedly flattened cobra-wise, and in addition the snake flattens the part of the body not erected against the ground. I think this is noticeable to a more marked degree in the ♀. By no means every specimen one meets displays this attitude of alarm, for while some erect themselves as soon as disturbed, others require a good deal of provocation before they are worked up to the necessary degree of excitement. Usually when disturbed it slips away to the nearest cover, moving actively and speedily, and when captured is a very restless little creature striving time after time to reach the nearest available cover.

It is evidently an adept climber, to successfully negotiate the smooth stems of bamboo that arise at first perpendicularly from the ground. The Bangalore snakemen told me that they frequently found it as high as 8 and 10 feet from the ground, and it was in such a situation that the conjoined pair brought to me were reported to have been found.

Food.—Specimens I had in captivity fed on frogs, and Mr. Ingleby found the frogs that he offered were taken. Günther* includes fishes in its dietary. I cannot recall ever having got a specimen that had recently fed in a state of liberty.

The sexes.—As far as I can judge from my notes the sexes in Fyzabad and Bangalore are evenly balanced. Females as already stated attain considerably greater length than males, but males have relatively much longer tails, and therefore more numerous subcaudal shields. The males of the S. Indian variety appear to have a brighter red dorsal line and females appear to be able to flatten themselves more noticeably. The ♂ clasper is beset with numerous small falciform processes from the base to the tip.

Breeding.—Our knowledge of this is somewhat fragmentary, and leaves a good deal yet to be elucidated. The mating season appears to be during the rains from the single dated observation available, which came under my own notice. None of the 4 adult females I had in Fyzabad were gravid which points to the deposition of eggs being already accomplished before August, unless mating had up till then not been in progress. The latter possi bility is suggested by the pair found "in copula" in Bangalore, and brought to me on the 27th of August. These were observed united reclining on a bamboo stem 8 or 10 feet above the ground. On the evening of the 26th an attempt was made to capture them, but not pressed as the snakemen feared they would not earn their reward of Rs. 5 if they separated. They were successfully captured next morning and brought to me still united, and I had them under observation for some time. As far as I know they did not disengage for at least 25½ hours. During this time I repeatedly examined them, and found the left clasper of the male engaged with the right orifice of the female. The ventral apposition of the two was so limited that nobody seeing them together would have suspected that they were coupled. They each lay in sinuous courses without their bodies or their tails being enwreathed and there was nothing demonstrative in their attachment as far as I could see at any time. Unfortunately the union was unfruitful, due, I believe, to my moving north to the United Provinces immediately after. The cold weather so far depressed the natural vigour of a *Macropisthodon plumbicolor* I also took from Bangalore with me, that a frog it swallowed remained undigested for some weeks and was subsequently disgorged and when the snake died 5 months and 6 days subsequently to its capture it was found to be gravid with the impregnated follicles but little enlarged, and much in the same state as the impregnated follicles of the *schistosus* at death. The period of gestation is not known.

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* Loc. cit.

Eggs.—The species is known to be oviparous from a cluster of eggs which Tennent* refers to which was found near a river in Ceylon, and from which 20 young snakes subsequently emerged. Unfortunately he does not give the date of their birthday. I had a gravid specimen sent me from Ceylon containing 10 eggs nearly one inch long but the date of capture was not recorded. My impregnated ♀ referred to above had 18 follicles enlarged. From these events it appears that *schistosus* is moderately productive.

Young.—The smallest specimens I have had both from Ceylon, measured 6⅝ and 6⅞ inches, and from their appearance I believe were hatchlings. Here again no dates were given as to date of capture.

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* Nat. Hist. of Ceylon, p. 308.

Distribution.—It is probably a commoner snake than available records which are rather meagre would make it appear. Before I went to the United Provinces it was not known to occur any where near there, but was evidently not uncommon. I got several specimens when stationed in Orissa (Berhampore). It is one of the commonest snakes about Bangalore, and is evidently common in Ceylon as I had 3 specimens in a small collection sent me from Henaratgoda.

It appears to be chiefly, if not entirely, a snake of the plains but is plentiful at 3,000 feet in Mysore, and has been recorded from the Anamallays and the Wynaad without any definite altitude being specified.

I have examined the three specimens collected by Anderson* in Yunnan which he referred to as a variety, *viz.*, *Yunnanensis*, but as all these specimens have the internasal shield divided, and a single internasal shield is one of the generic characters, and constant in all the other species it seems to me that these should be referred to a species apart from *schistosus* and unless the generic characters are modified should not even rank as a *Helicops*. Besides this feature in lepidosis, there is another, *viz.*, that the nasal shields in Anderson's specimens touch the 1st and 2nd supralabials, whereas in Indian specimens it almost always touches the 1st only.

The Malay Peninsula which has been included within its area of distribution on Cantor's authority I discredit, having already shown good cause to doubt many of Cantor's records.† No less than six Indian species have been recorded by this authority alone, from the Malay Peninsula, and as he received snakes from India the inference is that Indian specimens got mixed with his own Malay collection.

The accompanying map shows the area of distribution based on present records, but it seems likely to be extended as our knowledge progresses.

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* Ann. Zool. Res. Yunnan 1879, p. 822.

† Bomb. N. H. Journl., Vol. XVIII, p. 720.

Lepidosis—Rostral.—Touches 5 shields, the nasal sutures largest. *Internasal*—Single. *Præfrontals*—Two, the suture between them subequal to the præfronto-frontal; in contact with internasal, nasal, loreal, præocular and supraoculars. *Frontal*—Touches 6 shields, the supraocular sutures longest. *Supraoculars*—Length and breadth rather less than frontal. *Nasal*—Semi-divided, touching the 1st only of the supralabial series usually, the 2nd also sometimes. *Loreal*—Single, about as long as high. *Præoculars*—One. *Postoculars*—Three. *Temporals*—Two, elongate, the lower touching the 6th, 7th and 8th supralabials. *Supralabials*—8, with the 3rd and 4th touching the eye, or 9 with 4th and 5th touching the eye. *Infralabials*—7, the 5th, 6th and 7th normally touching the posterior sublinguals, 7th largest and touching 3 scales behind. *Sublinguals*—Two pairs, the posterior rather the larger. *Costals*—Two headslengths behind head 19, midbody 19, two headslengths before vent 17. Where the rows reduce from 19 to 17 the 4th row above the ventrals is absorbed into the one above or below. (This step usually well behind midbody sometimes occurs at midbody or even slightly before this); keels distinct except in the last two rows in midbody where they are absent; apical pits wanting. *Ventrals*—139 to 149 in Bangalore specimens, 145 to 157 in Fyzabad (Boulenger 129 to 151). *Anal*—Divided. *Subcaudals*—Divided, 63 to 82 (Boulenger 55 to 85).

Anomalies.—I have twice seen the internasal partially divided posteriorly in Indian specimens. I have twice seen 3 præfrontals in a transverse series, the median rather the smallest. Once there were but 2 postoculars on one side. Once the last ventral was divided and once the 35th, 36th and 37th ventrals were divided. In one example there were only 7 supralabials, the 3rd and 4th touching the eye.

*Dentition**—*Maxillary*—19 to 21, gradually but progressively increasing in size posteriorly with no gap. *Palatine*—11, subequal, and about the same size as the median maxillary. *Pterygoid*—17 to 18, subequal, and about the same size as palatine. *Mandi-*

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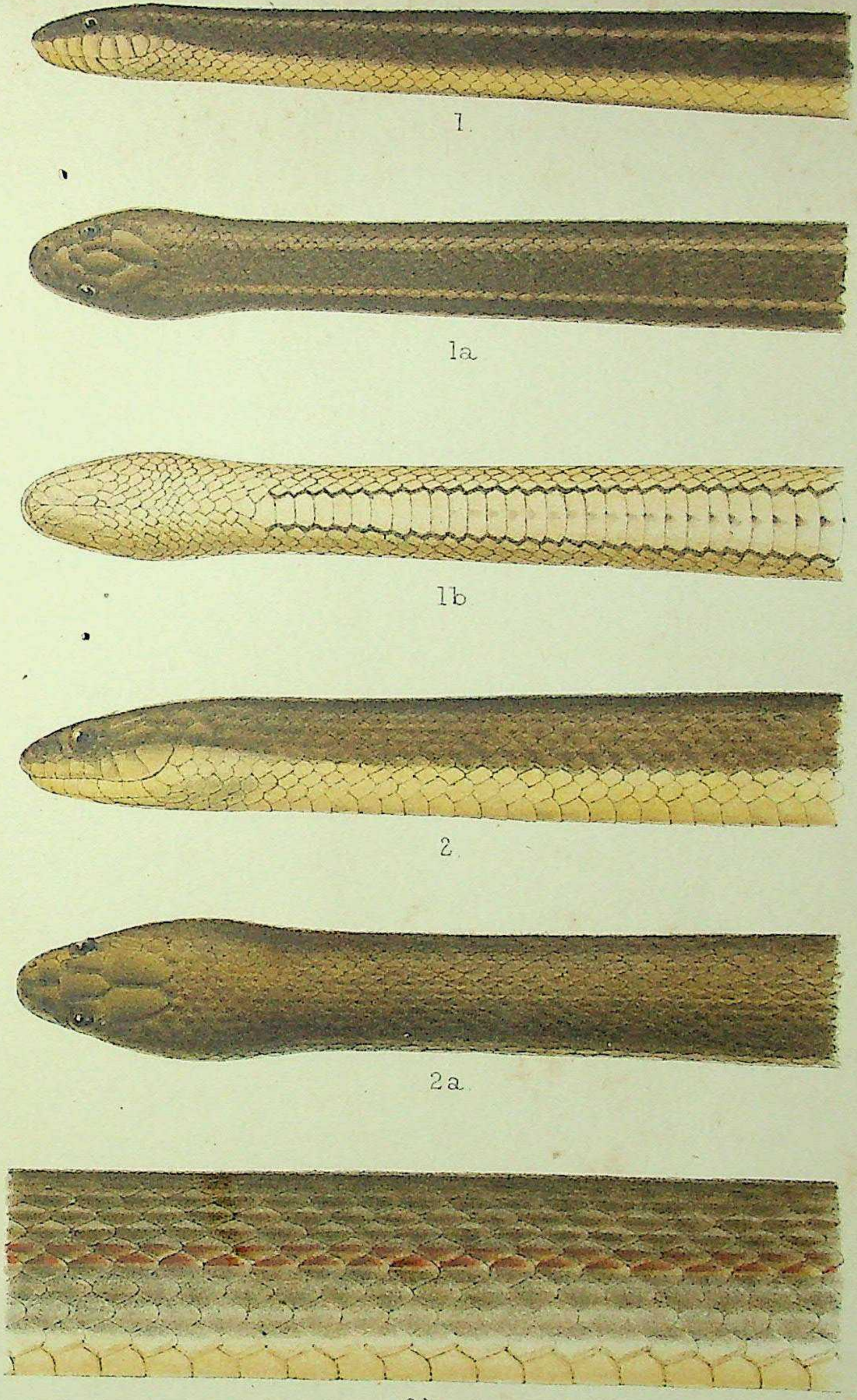
* From 2 Fyzabad skulls.



P. Gerhardt del.   J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1. Hypsirhina enhydris, *poisonous, nat. size.*
2. Helicops schistosus, *harmless, nat. size.*

bular—20 to 22, subequal, the first and last perhaps rather shortest.

Our plate leaves nothing to be desired, unless it is the dorsal colour which is usually of a greener tinge.

HYPSIRHINA ENHYDRIS (Schneider).

SCHNEIDER'S WATER SNAKE.

This snake being furnished with grooved teeth in the back of the maxilla comes into the opisthoglyphous "series" of colubrines. The series includes three subfamilies, *viz.*, *Homalopsinæ*, *Dipsadomorphiinæ* and *Elachistodontinæ*.

The homalopsids are true fresh water snakes and classified in ten genera, seven of which are represented in India. One of these, *viz.*, *Hypsirhina*, includes fifteen species; one of which *enhydris* forms the subject of this paper. The type of the genus is *H. plumbea* which inhabits the Malayo-Chinese area and has been found in Burma.

History.—Our first introduction to *H. enhydris* is through Russell*, who under the name "Mutta pam" figured and remarked upon a specimen in 1796 which had been captured in an Eel trap in the Lake of Ankapilly (North of the Godavery, near Vizagapatam). Three years later Schneider alluded to it in his History of Amphibians, under the name *Hydrus enhydris*.

Nomenclature—Scientific.—The generic name from the Greek "hypsi," high, and "rhis," the nose, was introduced by Wagler in 1830 on account of the high position of the nostrils on the snout. The specific name also from the Greek "En," in, and "hydor," water, was given in 1799 by Schneider in allusion to its aquatic mode of life.

English.—Schneider's Water Snake suggests itself, reserving Russell's name to designate the other common water snake first alluded to by him and to which Schneider also stands as godfather. I refer to *Cerberus rhynchops*.

Vernacular.—The names mentioned by Russell are the only ones known to me in India. These "Mutta pam," mud snake, and

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* Ind. Serp., Vol. 1, pl. XXX.

"Ally pam" are presumably in use in the Vizagapatam District. In most places in India I expect it would come under that very comprehensive title "pani ka samp." Günther mentions "oular ayer" as the name by which it is known to the natives in Java, and Flower says—"In Siam it is called "Ngu-pla," or fish snake, in common with other homalopsids.

General characters.—The head is moderately depressed and the snout evenly rounded so as to present no canthus. The muzzle is rather long, and presents a moderately rounded anterior outline. The nostrils which are transverse slits, are placed on the top of the snout, and perforate the middle of the nasal shields, a suture running from them to the first supralabials. The eye is rather small, placed high on the face and set laterally with an inclination forwards and upwards. The iris is studded with golden specks, especially at the pupillary margin so that the vertically elliptic shape of the pupil is distinctly revealed. The commissure of the mouth turns up abruptly behind.

The body is smooth glossy and cylindrical, of moderate calibre for the length of the snake and dwindles to a neck anteriorly. Posteriorly the attenuation is more gradual. The tail is about one-fifth the total length.

Dimensions.—I have seen no specimens exceeding the measurement given by Boulenger which is 2 feet 2¾ inches (680 mm). My largest specimen was 2 inches less.

Colouration.—Dorsally the snake is a dark olivaceous green, or olivaceous brown, this colour ending abruptly on the 3rd costal row above the ventrals, and just above the supralabial on the side of the face. Usually there is a pale stripe down the body on the 8th row above the ventrals, but this may be obscure or even absent. The belly and the lowermost two and a half costal rows are pale lemon-yellow. The ventrals are demarcated laterally by a dark line and there is often too a median continuous, or interrupted dark line in the middle of the belly, but this may be entirely absent.

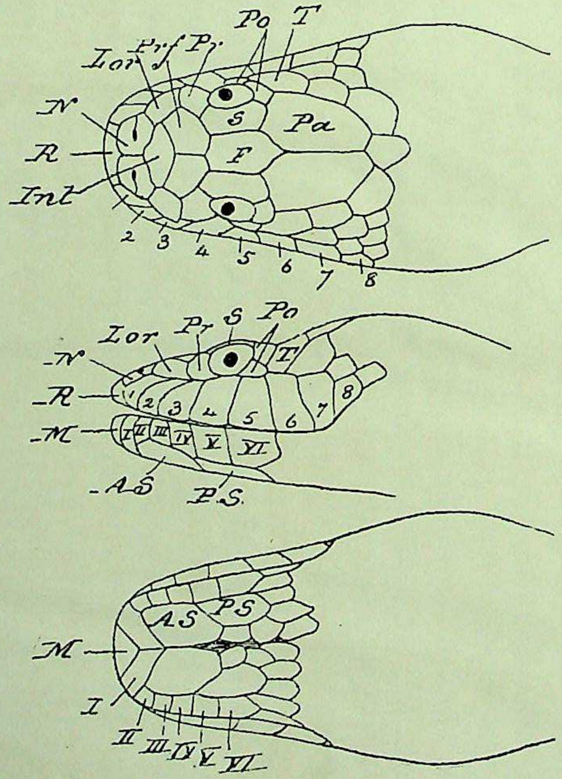
(*H. bilineata* and *H. furcata* (Gray). A specimen sent to me by Captain Frere from Mimbu, Burma, has a beautiful coral-pink stripe in the flanks, anteriorly on two rows (the penultimate and

THE COMMON INDIAN SNAKES.

Hypsirhina enhydris.

EXPLANATION OF DIAGRAM.

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasals.
Lor.	Loreal.
M.	Mental.
N.	Nasal.
Pa.	Parietal.
Po.	Postocular.
Pr.	Præocular.
Prf.	Præfrontal.
P. S.	Posterior Sublingual.
R.	Rostral.
S.	Supraocular.
T.	Temporal.
1 to 8.	Supralabials.
I to VI.	Infralabials.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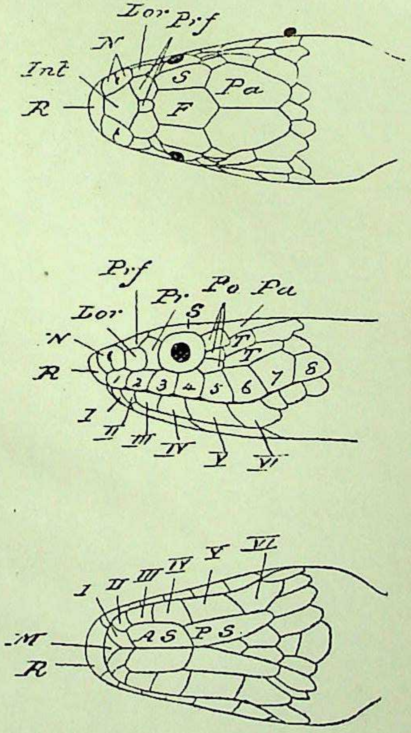
Hypsirhina enhydris (×2).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Helicops schistosus ($\frac{1}{1}$).

COMMON SNAKES OF INDIA.

ante-penultimate), later on the penultimate only. This stripe begins behind the neck and ends before the vent. The specimen otherwise is like Indian examples. Flower records a specimen from Kedah in the Malay Peninsula which appears to have had five ventral lines instead of the normal three.)

Identification.—This is very easy. First note that the nasal shields are in contact behind the rostral, then count the scale rows in midbody which will be found to be 21 to 23.

Disposition.—I cannot recall ever having seen a live specimen, but Dr. Cantor who appears to have been very familiar with it says it is a timid inoffensive snake.

Haunts.—Schneider's water snake is thoroughly aquatic in habit, as might be inferred from the character, and position of its nostrils. It frequents rivers, estuaries, lakes and marshy ground, even being found according to Cantor in irrigated fields.

Food.—Dr. Cantor states that it feeds on fishes under natural conditions, though these were not acceptable in captivity.

Breeding.—Captain (now Colonel) G. H. Evans came across a pair "in copula" at Hmawbi (Lower Burma) on the 16th October * 1899, which were unfortunately despatched instead of being kept for the fruits of their intercourse. The two snakes measured 1 foot 8½ inches and 1 foot 8¾ inches, and though the sexes were not at the time ascertained we may presume the former to have been the ♀ by the numbers of the ventral and subcaudal shields, which were 169 + 67. In the longer specimen these shields counted 161 + 72. Another ♀ was taken by Theobald † near Rangoon in a gravid condition in March. She measured 18 inches and contained 6 eggs. Although it is definitely known that the species is viviparous from Cantor's observations, the period of gestation is not known as it appears from his account that a ♂ shared the incarceration. Apparently congress was not witnessed but after six months' captivity the ♀ gave birth to 11 young. During parturition it was observed that the anterior part of the abdomen was retracted towards the spine. The mother died immediately after the event, and two of her brood within two hours. These were noted to have measured 6 and 6¼ inches. The young sloughed immediately after birth, even the two that succumbed so soon having accomplished this function. The remainder of the family wreathed themselves round the ♂, lifting their heads at intervals to the surface to breathe. All died within two months. The season when the event took place is not noted.

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* Not as originally reported November.

† Cat. Rept. Brit. Burma, p. 57.

Parasites.—A specimen sent to me from Champaran (Behar) had numerous nematodes in the stomach, probably the same worm that is so frequently seen in the stomach of the chequered keelback (*Tropidonotus piscator*) and other snakes. I took it to be this worm, *viz.*, *Kallicephalus willeyi.* As a result of this parasitic invasion the organ was much thickened, and its walls rigid and distorted.

Distribution.—North-East India, Assam, Burma, and the South of the Asian Continent through Indo-China to China. Tenasserim, Malay Peninsula to the Archipelago as far East as Celebes.

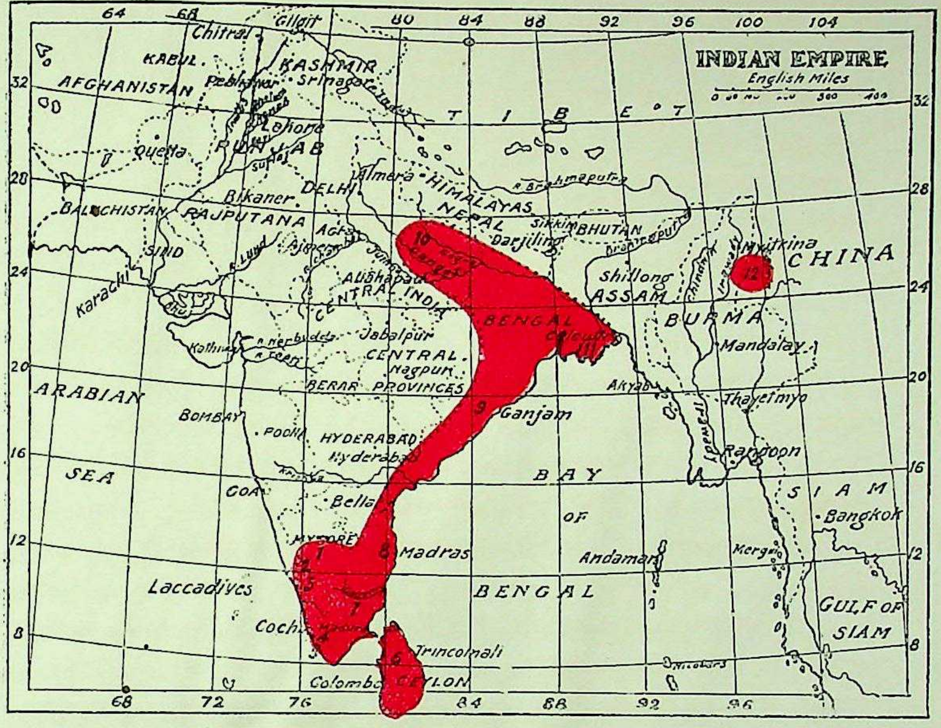
Though Ceylon is mentioned by Flower and Boulenger (Cat. 1896) I can find no authority for this. It was not mentioned in Haly's list of Ceylon snakes in 1891, nor in Willey's list published as recently as 1906 (Spol. Zeylan. April 1906, p. 233). Further though Jerdon says it occurs in Southern India I can find no record of it south of the Godavery River. There is a specimen in the British Museum presented by Jerdon, and reported as from Darjeeling. This in all probability means Darjeeling District, and probably came from the base of the Himalayas. I have had a specimen from Jalpaiguri in the same neighbourhood. Though known from Burma and Tenasserim it has not as yet been reported from the Andamans or Nicobars.

The precise localities known to me are shown in the accompanying map.

It may be a commoner snake in India than available records make it appear. In Assam too the same remark may apply. In Burma Theobald says it is common in the Pegu District, and Evans and I collected 9 specimens in 15 months, in the Lower part of that Province.

Distribution of *Helicops schistosus.*

......Implies limits uncertain.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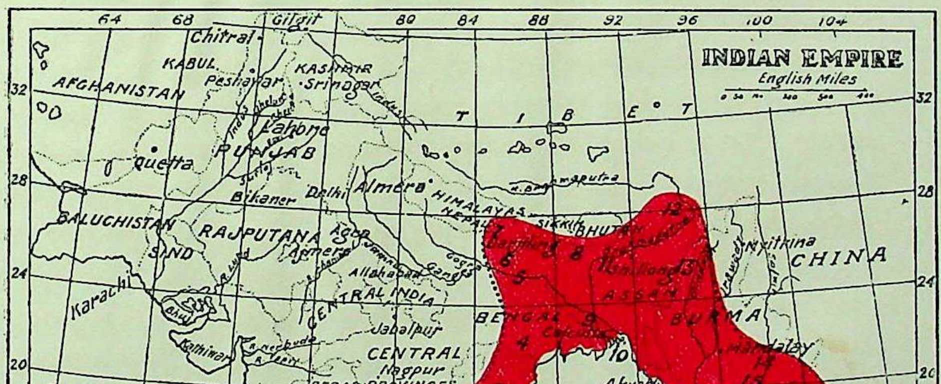
Distribution of *Hypsirhina enhydris.*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Nicobars
T I B E T

Lepidosis—Rostral.—Touches 4 shields. *Nasals*—In contact behind the rostral; semi-divided; in contact with only the 1st of the supralabial series. *Internasal.*—Single, broader than long. *Praefrontals*—A pair; in contact with internasal, loreal, præocular and supraocular. *Frontal*—Touches 6 shields, the fronto-supraocular sutures longest. *Supraocular.*—Breadth and length rather less than frontal. *Loreal*—One. *Praeocular*—One. *Postoculars*—Two. *Temporal*—One. *Supralabials*—8 normally, the 4th only touching the eye. *Infralabials*—6; the 6th longest, the 3rd, 4th, 5th and 6th, or the three latter only touching the posterior sublinguals. *Sublinguals*—Two pairs; the anterior larger. The posterior quite separated by scales. *Costals*—Two headslengths behind head usually 23 (rarely 25), midbody usually 21 (rarely 23), two headslengths before vent 21; smooth. *Ventrals*—150 to 177, rather narrow so that 3 or 4 rows of costals can be seen on each side when the snake is laid on its back. *Anal*—Divided. *Subcaudals*—47 to 78, divided.

Anomalies—I have seen two præoculars once, and two temporals once. The last two ventrals were divided in one specimen, and the last only in another. In another example the 38th to 54th subcaudals were entire.

Dentition.—Maxillary teeth 17, subequal; followed after a short gap that would take one tooth, by a pair of enlarged, obliquely set teeth deeply grooved on their anterior faces. *Palatine*—10 to 11 subequal, as well developed as the maxillary. *Pterygoid*—18 to 24, as well developed anteriorly as the maxillary; decreasing in size posteriorly. *Mandibular.*—23 to 24, subequal as long as the maxillary.

Our plate is excellent in every particular.

(*To be continued.*)

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Colonel C. J. Bamber, F.L.S.,

Indian Medical Service.

Part X.

(*Continued from page 228 of this Volume.*)

Herbs, erect, with Alternate Stipulate Lobed Leaves.

Petals United.

Lavatera kashmiriana,
Malvaceæ.
F. B. I. i. 319.
Kashmir.
Hazara, 7-8,000 ft.

stems covered with down, branching; leaves lower, 5-lobed, circular, heart-shaped at the base, round-toothed, smooth above, downy beneath, stalk as long as the blade, upper 3-5 lobed, lobes short-pointed, central longest, stipules linear-lanceolate; flowers 3 in. diam., pink, on axillary stalks, bracteoles 3, united below, broadly ovate, shortly pointed, sepals 5, lanceolate, longer than the bracteoles, petals 5, united below, wedge-shaped, deeply bifid, stamens united into a column, woolly, styles many; carpels many, separating from the axis, kidney-shaped, smooth, shorter than the axis seeds one in each carpel.

Malva verticillata,
Malvaceæ.
F. B. I. i. 320.
The Plains to 12,000 ft.
Simla, Matiana (Collett).

large, branched, downy, annual or perennial; leaves 2-6 in. diam., nearly round, 5-6 shallow lobes, downy, stalks 6-7 in., stipules lanceolate, hairy; flowers small, pale pink crowded in nearly sessile axillary clusters, bracteoles 3, ununited, linear, sepals 5, united below, triangular lanceolate, petal 5, united below, twice the length of the sepals, margin notched, stamens united into a tube, styles

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

10-12; carpels 10-12, enclosed in the enlarged calyx, netted on the sides, ribbed at the back, each carpel one-seeded. This plant is sometimes used as a potherb.

Malva sylvestris,
Large mallow,
MALVACEÆ.
F. B. I. i. 320.
The Plains to 8,000 ft.
Theog (Collett).
Kashmir.
Hazara.

medium-size, annual, smooth or with a few hairs; leaves 1-3 in. diam., 5-7 blunt, shallow lobes, rounded, base heart-shaped, stalks 1-3 in., stipules oval, short-pointed; flowers 1-1½ in. diam., pink streaked with purple, on axillary stalks, 1 in. long, bracteoles ovate, shorter than the bell-shaped calyx, petals with bearded stalked bases, carpels downy or not, netted; otherwise like the last species.

Abutiion graveolens,

see Herbs, Erect, Alternate, Stipulate, Simple.

Urena repanda,
MALVACEÆ.
F. B. I. i. 330.
The Plains to 1,000 ft.
East of the Sutlej.

medium-size, perennial, much branched, covered with star-shaped hairs; leaves, lower 2-2½ in. long, roundish, somewhat lobed, heart-shaped base, slightly toothed with rounded notches, upper lanceolate, stipules linear; flowers ⅔ in. pink in racemes, ultimately in leafless clusters, bracteoles 5, ¼-⅓ in., awl-shaped, united below into a strongly ribbed cup, nearly leathery, larger than the calyx, sepals 5, united half way up, stamens united into a tube, styles 10; carpels 5, smooth, separating from the axis when ripe, each carpel one-seeded, seeds smooth.

Hibiscus Trionum,
MALVACEÆ.
F. B. I. i. 334.
The Plains to 6,000 ft.
Kashmir.
Hazara.
Sutlej Valley (Collett).
Baluchistan (Lace).

medium-size, annual, more or less coverd with star-shaped hairs; leaves 1-1½ in., divided to the base (lower leaves sometimes circular, undivided), lobes usually 3, lobed and toothed, stalks 1-1½ in. long, stipules awl-shaped, covered with long stiff hairs; flowers 1½ in. diam., pale yellow with a dark-purple centre, calyx 5-lobed to the middle, bell-shaped, inflated, lobes broad, short pointed, nerves

HREBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

hairy winding, afterwards purple, petals 5, united below and with the staminal tube, stamens united into a tube, styles 5, united half way up; capsule oblong, blunt, 5-celled, velvety, splitting from above into 5 valves, seeds many, kidney-shaped, velvety with star-shaped hairs.

Hibiscus surattensis, see Prostrate Herbs, Alternate, Stipulate, Lobed.

Hibiscus Solandra,
MALVACEÆ.
F. B. I. i. 336.
The Plains to 5,000 ft.
Simla.
Sutlej Valley (Collett).

medium-size, annual, velvety or hairy, slightly branched; leaves 1-2½ in. across, heart-shaped at the base, short-pointed, coarsely toothed, hairy on both sides, lower leaves long-stalked, ovate or circular, more or less 3-lobed, upper deeply 3-lobed, lobes narrowly oblong, stipules bristly, flowers ½-¾ in. diam., yellow, white or pink on solitary jointed axillary stalks, 1½ in. long, in a loose leafless terminal raceme, sepals united below, triangular, short pointed, petals broad at the tip, notched; capsule ovoid, pointed, hairy at the top, not longer than the calyx, seeds blackish; otherwise like *Hibiscus Trionum.*

Hibiscus vitifolius,
Ban kapás.
MALVACEÆ.
F. B. I. i. 338.
The Plains to 2,000 ft.

large, annual or biennial, hairy, slightly prickly, branches many; leaves 1-4 in. diam., 3-7 lobed, lobes short-or long-pointed, smooth or felted on both surfaces, toothed, stalks 2½ in., stipules very small, bristly; flowers 2½ in. diam., yellow with a purple centre, drooping on axillary, solitary or clustered at the end of branches, stalks jointed bracteoles 5-8, bristly, linear,not united and shorter than the calyx, sepals united half way up, lanceolate, velvety, petals twc or three times as long as the sepals, capsule hairy, beaked, 5-winged, shorter than the sepals, seeds brown, tubercled; otherwise like the last species. The bark yields a strong silvery fibre.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

Hibiscus Gibsoni,
MALVACEÆ.
F. B. I. i. 339.
The Plains.

medim-size, perennial, branches bristly or prickly; leaves 1-3 in., deeply divided into lobes, lobes oblong-lanceolate, toothed, smooth or hairy, stalk as long as the blade; flowers twice the length of the bracteoles, yellow with a purple centre or all purple, on solitary axillary stalks, bracteoles ununited, linear, prickly, curving over the calyx, sepals united below, lanceolate, staminal tube half covered with anthers, capsule ovoid, pointed, valves bristly, seeds soft with scattered hairs; in other points like the last species.

Hibiscus Sabdariffa,
Rozelle or Red sorrel,
Patwa.
MALVACEÆ.
F. B. I. i. 340.
The Plains cultivated.

large, annual, smooth, stem purplish; leaves 2-3 in., wedge-shaped at the base, usually 3-5 lobed, lower leaves are sometimes not lobed, lobes lanceolate or oblong, glandular beneath, toothed, stalk 2 in., reddish, stipules ½ in. long, linear, short pointed; flowers 2½ in. diam., yellow or purple on solitary axillary short stalks, thickened at the top, bracteoles 8-12, united to the base of the calyx, calyx enlarging in fruit, sepals united below the middle into a fleshy purple cap, bristly, capsule ovoid, pointed, hairy, shorter than the calyx, seeds nearly glabrous, kidney-shaped; otherwise like the last species. This plant is cultivated for the sake of the edible calyx, from which an acid jelly is prepared; it is used as a preventive of scurvy. The stems supply a strong silky fibre.

Hibiscus ficulneus,
MALVACEÆ.
F. B. I. i. 340.
The Plains.

very large, annual, branches usually covered with broad-based sharp prickles; leaves 2½-4 in., 5-7-lobed, with wide sinuses between the lobes, lobes broad at the tip, narrow at the base, unequally toothed stalks 2½-4 in., stipules ¼ in. long, linear, hairy, soon falling off; flowers 1-2 in. diam., white with a pink centre, on stalks, ½ the length of the leaf stalks, the upper in a leafless raceme, bracteoles 4-6, broad, leafy, sepals united nearly entirely, tips

Herbs, erect, with Alternate Stipulate Lobed Leaves.

Petals United.

thread-like, capsule 1½ in. long, ovoid, felted, with a curved beak, 5-angled, sticky when young, seeds round, softly hairy ; otherwise like the last species.

Hibiscus pungens
Malvaceæ.
F. B. I. i. 341.
Himalaya, 2-5,000 ft.
(Duthie).

medium-size, annual or perennial, branches bristly and dotted; leaves 5-8 in., heart-shaped, 7-lobed, lobes linear-lanceolate, long pointed, deeply toothed, upper 3-lobed, stalk longer than the blade, stipules broadly lanceolate, upper ones linear; flowers 5 in. diam., yellow with a purple centre drooping on racemose stalks 1-2 in. long, bracteoles 1 in., enlarging in fruit, calyx 5-toothed, staminal column with anthers all the way up, capsule ¾ in. long, slender, hairy ; otherwise like the last species.

Hibiscus Abelmoschus,
Musk mallow,
Mushk dana, Kasturi bhendi.
Malvaceæ.
F. B. I. i. 342.
The Plains.

large, annual, hairy, branched; leaves heart-shaped, ovate or usually 3-7-lobed, lobes oblong-lanceolate, short-or long-pointed, coarsely toothed, hairy above or below, stalk longer than the blade, stipules small, awl-shaped; flowers 3-4 in. diam., yellow with a crimson centre, solitary, often apparently terminal on stout curved stalks, bracteoles 6-12, linear, ununited, hairy, much shorter than the calyx, sepals united except the 5 tips, split down on one side, capsule 2½-3 in., ovate, short-pointed, hairy, seeds kidney-shaped, with a musky scent; otherwise like the last species. Musk is obtained from this plant and it also yields a strong fibre, it is cultivated for these reasons.

Hibiscus canceilatus,
Malvaceæ.
F. B. I. i. 342.
The Plains to 6,000 ft.
Simla, Syri (Collett).
Hazara (Douie).

large, annual, bristly, root spindle-shaped ; leaves 4-6 in., bluntly five-angled, or rounded, round toothed, hairy, upper leaves with angular lobes at the base, stalks 4 in., stipules linear; flowers 4-5 in. diam., drooping, yellow with a purple centre on stalks much shorter than the leaf-stalks, racemed at the ends of branches, bracts 2 at the base of each stalk, awl-shaped, bracteoles 10-18, 1½ in. long, linear, bristly, incurved, capsule ovoid, furrowed, very hairy, equal in length to the bracteoles.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

seeds many, kidney-shaped, black, not musky; otherwise like the last species.

Hibiscus esculentus,
Okra.
Bhindi, ramturai.
MALVACEÆ.
F. B. I. i. 343.
The Plains to 4,000 ft. cultivated.

large, annual, roughly hairy; leaves 8-12 in. long, 3-5-lobed, heart-shaped at the base, lobes lanceolate-oblong, coarsely toothed, rough, stalk as long as the blade, reddish, stipules linear; flowers large, yellow with a crimson centre on stout short stalks, shorter than the leaf-stalks, bracteoles 8-10, linear, equal in length to the calyx, soon falling off, capsule 6-10 in. long, oblong, tapering, 6-8 ribbed, smooth or hairy seeds many, round, with lines, smooth or hairy, otherwise like the last species. This plant is commonly cultivated as an unripe capsule and seeds are eaten as a vegetable. It yields a silky fibre which is used in paper making.

Pentapetes phœnicea,
Dopahariya.
STERCULIACEÆ.
F. B. I. i. 371.
The Plains in wet places.

large, annual, smooth or bearing a few scattered star-shaped hairs, branched; leaves 3-5 in., triangular or lanceolate with two lobes at the base, round-toothed, smooth above, star-shaped hairs on the veins beneath, stalk 1 in., stipules linear, equal in length to the stalk; flowers 1-1½ in., scarlet, open at noon, drop next morning, one or two together on jointed axillary stalks, bracteoles 3-5, thread-like, half the length of the calyx, soon falling off, sepals 5, lanceolate, united below, rough, petals 5, ovate with a broad tip, stamens 20, 15 fertile in 5 groups of three, alternating with 5 unfertile (staminodes) style dividing above and twisted, stigmas 5, minute; capsule ½ in. diam., nearly round, bristly with star-shaped hairs, shorter than the persistent sepals, seeds 8-12, in two rows in each of the 5 cells, angular rough.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia Dracunculus, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia parviflora, see Herbs, Erect, Alternate, Exstipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia scoparia,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia annua,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia maritima,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia vulgaris,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Roxburghiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia vestita,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia laciniata,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Moorcroftiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Absinthium,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Sieversiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.

PETALS NONE.

Rumex hastatus,
POLYGONACEÆ.
F. B. I. v. 60.
Himalaya, 1-8,000 ft.
Kashmir.
Simla (Collett).
Hazara (Barrett).

medium-size, perennial root, stems and branches grooved, smooth; leaves 1-2½ by ¾-2 in., stalked, 3-lobed, two lobes projecting backwards, narrow, or not lobed, broadly triangular, long pointed, stipules tubular, thin, not fringed, soon torn and disappearing; flowers green, small, males and females, often turning red, in circular distant clusters forming axillary racemes and terminal branching racemes, often crowded in fruit, calyx 6-lobed, in fruit circular, pink, not fringed, notched at both ends, petals none, stamens 6, styles 3, stigmas fringed; nut sharply 3-angled, brown, enclosed in the three inner segments of the calyx.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS NONE.

Rumex acetosa,
POLYGONACEÆ.
F. B. I. v. 60.
Himalaya, 8-12,000 ft.
Kashmir.

like the last species, but male and female flowers on separate plants, branches few, racemes leafless, outer sepals reflexed.

Cannabis sativa,
Indian Hemp,
Bhang.
URTICACEÆ.
F. B. I. v. 487.
The Plains to 9,000 ft.
Hazara (Barrett).
Simla (Collett).
Baluchistan (Hughes-Buller).

large, annual, stems gooved, felted, branches few, erect, slender, a common weed, also cultivated, leaves 4-8 in. diam., opposite, stalked, much divided, upper leaves 1-5 lobed, lower 5-11 lobed, linear-lanceolate, middle lobe longest, coarsely and sharply toothed, long pointed, wedge-shaped at the base, dark green above, downy below, stipules lateral, awl-shaped, bristly; flowers greenish yellow, small, male and female on separate plants, males clustered in short, axillary, drooping branched racemes, calyx of 5 segments, segments boat-shaped, petals none, stamens 5, filaments long, thread-like, females crowded, sessile in the axils of leafy bracts, style arms 2, thread-like; achenes 1-12 in., flattened, hard, enclosed in the persistent bracts. The intoxicating drugs, ganja and charas consist of the resin obtained from the stem, young leaves and flowers, bhang is merely the dried leaves and achenes. Hemp is obtained from the fibrous stems.

Girardinia heterophylla,
Ker.
URTICACEÆ.
F. B. I. v. 550.
Himalaya, 5-8,000 ft.
Hazara (Barrett).
Simla (Collett).

large, annual, root perennial, stem and branches furrowed, covered with very long stinging hairs like a nettle: leaves 4-12 in. long and broad, long-stalked, 3-nerved from the base, broadly ovate, upper leaves 3-5 lobed, heart-shaped at the base, sharply toothed, stipules large, united, leaf-like, divided at the tip; flowers small, green, sessile, closely crowded, male and female on the same or separate plants, when male and female are together, the male are in nearly cylindric clusters on the lower part of the spike, and the female in clustered heads in the upper part, when separate, male in long slender, often branched spikes, and female in short oblong spikes, in fruit becoming thick and densely bristly; male flowers,

HERBS, ERECT, WITH ALTERNATE STIPULTE LOBED LEAVES.

PETALS NONE.

calyx of 4 sepals, petals none, stamens 4, female flowers calyx tubular with a small 3-toothed mouth, splitting in fruit, style long, thread-like, persistent, stigma minute; capsule (achene) broad, flattened, ovate, black.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Thermopsis barbata,
LEGUMINOSÆ.
F. B. I. ii. 62.
Himalaya, 8-12,000 ft.
Kashmir.
Patarnala (Collett).

small to medium-size, perennial, rootstock woody, stems tufted, branches many, densely shaggy; leaves of 3 sessile leaflets with leaf-like stipules at the base, each node appearing to have a tuft of simple leaves, leaflets smooth or hairy, lanceolate, 1-2 in., entire; flowers dark-purple, 1 in. long, clustered in short axillary racemes forming a terminal branched raceme, bracts shaggy, united at the base or free, calyx top-shaped, 5-toothed, teeth lanceolate, two upper more or less united, three lower twice the tube, petals 5, all long stalked, posterior (standard) largest, circular, sides turned back, 2 wing petals, ovate, outer part broader, 2 keel petals faintly joined, oblong-ovate, stamens 10, ununited, style thread-like, incurved; pot 1-2 by $\frac{1}{2}$-$\frac{5}{8}$ in.,linear-oblong. short-pointed, seeds 2-6.

Argyrolobium roseum,
LEGUMINOSÆ.
F. B. I. ii. 64.
The Plains to 6,000 ft.
Rawalpindi.
Kahuta (Douie).
Baluchistan (Boissier).

small, perennial, thinly silky, branches slender, spreading or prostrate; leaves digitately compound, leaflets 3, $\frac{1}{3}$ in., ovate with a broad rounded tip, base wedge-shaped, sessile, leaf-stalk equal to or shorter than the leaves, stipules minute, linear, persistent, ununited; flowers $\frac{3}{8}$ in., pink or yellow tinged with pink in 1-4 flowered leaf-opposed stalked racemes, longer than the leaves, calyx $\frac{1}{4}$ in., 2-lipped, slit nearly to the base, 5 distinct teeth, 2 to the upper, 3 to the lower lip, smooth, lanceolate, petals 5, hardly longer than the calyx, standard oblong-circular, notched longer than the upper lip of

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

	the calyx, wings oblong, keel broadly oblong, blunt, shorter than the standard, stamens 10, all united, 5 longer with large anthers attached at the end, 5 shorter with smaller anthers attached in the middle, style long, thread-like, incurved ; pod $\frac{3}{4}$ in. long, erect, straight, narrow, flattened, seeds 10-15.
Lotononis Leobordea, LEGUMINOSÆ. F. B. I. ii. 64. Peshawar (Stewart). Baluchistan (Hughes-Buller).	small, annual, finely silky, branches many, spreading ; leaves digitately compound, leaflets 3, $\frac{1}{4}$-$\frac{1}{2}$ in. long, lanceolate, rather fleshy, tip blunt, broad, with a minutely fine point, leaf stalks as long as the leaves, stipules minute, lanceolate, soon falling off ; flowers $\frac{1}{4}$ in., pale yellow or red, nearly sessile, 1-5, in the axils of most of the leaves, calyx $\frac{1}{6}$-$\frac{1}{5}$ in., silky teeth 5, lowest tooth deepest, petals 5, a little longer than the calyx, standard narrow, wings shorter, narrower, keel petals firmly united, longer, tip sharply incurved, stamens 10, united in a tube, slit along the top, anthers as in the last species ; pod linear-oblong, scarcely longer than the calyx, seeds 4-8.
Crotalaria medicaginea,	see Prostrate Herbs, Alternate, Stipulate, Compound.
Ononis hircina,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Trifolium pratense,	see Prostrate Herbs, Alternate, Stipulate, Compound.
Trigonella Fœnum-grœcum, **Fenugreek,** *Methi.* LEGUMINOSÆ. F. B. I. ii. 87. The Plains to 5,000 ft. Kashmir. Hazara. Baluchistan (Lace).	medium-size, annual, cultivated, strongly scented, robust, nearly smooth ; leaves pinnately compound, leaflets $\frac{3}{4}$-1 in. long, lanceolate-oblong, tip broad, toothed, lateral nearly sessile, terminal stalked nerves prominent running into the teeth, stipules lanceolate, entire, long pointed, united to the leaf-stalk ; flowers small, pale yellow in short racemes at the end of axillary stalk, often bristle tipped, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., bell-shaped, teeth 5, distinct, linear, petals 5, narrow, standard and wings nearly equal, keel

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

shorter, blunt, a little longer than the calyx, stamens 10, upper nearly or quite free, others united; pod 2-3 in. long, often curved, long-beaked, seeds 10-20. This plant is cultivated as a fodder crop and a pot herb, the seeds are used as a spice and as a medicine.

Trigonella polycerata,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Trigonella Emodi,
LEGUMINOSÆ.
F. B. I. ii. 88.
Himalaya, 4-11,000 ft.
Kashmir.
Marali.
Baluchistan (Hughes-Buller).

medium size, often robust, smooth, much branched; leaflets 3, $\frac{1}{3}$-$\frac{3}{4}$ in. long, ovate with a broad tip, deeply toothed; stipules linear bristly, deeply toothed; flowers 4-6 rarely 12, racemes on stalks 1-2 in. long, terminating in a distinct point, calyx $\frac{1}{8}$-$\frac{1}{6}$ in., smooth, teeth linear as long as the tube corolla twice or thrice as long as the calyx; pod $\frac{1}{2}$-$\frac{3}{4}$ by $\frac{1}{6}$-$\frac{1}{5}$ in., linear-oblong, smooth, straight, seeds 4-6; otherwise like the last described species.

Trigonella corniculata,
LEGUMINOSÆ.
F. B. I. ii. 88.
The Plains to 12,000 ft.
Kashmir.
Simla (Collett).

very like the last species, but the calyx teeth are shorter, the pod is recurved instead of straight.

Melilotus parviflora,
or indica,
Melilot,
Sinji, metha.
LEGUMINOSÆ.
The Plains to 3,000 ft.
Jœngi.
Mianwalli District.

medium size, annual, slender, leaves pinnately compound, leaflets $\frac{1}{4}$-$\frac{1}{2}$ in., ovate or oblong, only upper part toothed, base entire, lateral leaflets nearly sessile, terminal one stalked, nerves prolonged to the teeth, stipules linear, long-pointed, united to the leaf-stalk, apex notched; flowers $\frac{1}{12}$ in., yellow in long axillary recemes, 1 in. long, in fruit lengthened to 2 in., calyx $\frac{1}{24}$ in., teeth 5, triangular, petals 5, $\frac{1}{12}$ in. soon falling off; pod $\frac{1}{21}$-$\frac{1}{8}$ in., tipped by the style, one-seeded. This plant

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

	is a common weed in cornfields, and is sometimes cultivated as a fodder crop.
Melilotus alba, **White Melilot,** LEGUMINOSÆ. F. B. I. ii. 89. The Plains to 13,000 ft. Simla (Collett). Mianwalli District.	very like the last species, but more robust and taller, the racemes, flowers and pod are larger, and the latter is often two-seeded. This plant is also used for fodder, and is fragrant when drying.
Medicago falcata, **Medick, non-such,** LEGUMINOSÆ. F. B. I. ii. 90. Himalaya, 5-10,000 ft. Mashobra (Collett). Kashmir.	medium size, perennial, nearly smooth, branches many; leaves pinnately compound, leaflets 3, $\frac{1}{2}$-1 in. long, narrowly oblong, upper part toothed, base entire, lateral leaflets sessile, terminal one stalked, nerves prolonged to the teeth, stipules narrowly lanceolate, long-pointed, united to the leaf-stalk: flowers $\frac{1}{8}$ in., yellow in axillary stalked racemes, calyx $\frac{1}{6}$ in., bell-shaped, teeth 5, bristlelike, nearly equal, as long as the tube, petals 5, standard petal not stalked, keel shorter than the wing petals, blunt, corolla twice as long as the calyx, stamens 10, upper one free, others united, style smooth, incurved; pod $\frac{1}{2}$-$\frac{3}{4}$ in. long, sickle-shaped, smooth, seed, 5-10.
Medicago sativa, **Lucerne,** *Alfafa.* LEGUMINOSÆ. F. B. I. ii. 90. The Plains to 5,000 ft. Baluchistan (Boissier).	very like the last species, of which it may be the cultivated variety, but is more erect, less branched; flowers purple or blue, and pods rough, twisted into a double spiral. This plant is widely cultivated as a fodder crop.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Cyamopsis psoraolides, *Kulthi, guár.* LEGUMINOSÆ. F. B. I. ii. 92. The Plains. Rawalpindi (Aitchison). Baluchistan (Hughes-Buller).	medium size, annual, robust, covered with laterally attached grey hairs, stems 4-sided; leaves stalked, leaflets 3, 2-3 in. long, ovate, short-pointed, deeply toothed, stipules linear-bristle-like; flowers $\frac{1}{4}$ in., purplish, in shortly stalked 6-30 crowded axillary racemes, bracts bristle-like, projecting beyond the buds, calyx $\frac{1}{6}$-$\frac{1}{3}$ in., tube oblique. teeth 5, unequal, lowest long, bristle-like, petals 5, just protruding from the calyx, soon falling off, standard and wing petals narrow, keel blunt, slightly incurved, stamens 10, united, style short, much incurved; pod $1\frac{1}{2}$-2 in. long, straight, thick, fleshy, erect, 3-keeled on back, seeds 8-12.
Indigofera trifoliata,	see Prostrate Herbs, Alternate, Stipulate, Compound.
Indigofera trita,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Taverniera nummularia,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Ebenus stellata,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Lespedeza juncea,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Lespedeza Gerardiana,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Lespedeza elegans,	see Shrubs, Erect, Alternate, Stipulate, Compound.
Lourea vespertilionis,	see Herbs, Erect, Alternate, Stipulate, Lobed.
Uraria picta.	see Herbs, Erect, Alternate, Stipulate, Compound, Leaflets many.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Uraria lagopus,

see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Uraria neglecta,

see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Zornia biphylla.
LEGUMINOSÆ.
F. B. I. ii. 147.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small, annual, stems several, slender, branches wiry, zigzag, hairy or velvety, tufted; leaves stalked, leaflets 2, ½-1 in., lanceolate, leathery, dotted with black glands, stipules leaflike, lanceolate, produced down in a spur; flowers ¼ in. long, yellow, sessile in erect axiliary racemes, 1-3 in., each flower almost hidden in a pair of leaf-like fringed bracts, calyx minute, membranous, teeth 5, 2 upper united, 2 lateral very short, lowest equal to the upper, petals 5, standard round, keel sharply incurved, blunt, twice as long as the calyx, stamens 10, united into a tube, 5 longer with round anthers, alternating with 5 shorter with oblong anthers, style smooth, incurved; pod flattened, minutely prickly, protruding from the bracts, upper margin nearly straight, lower deeply indented, joints 2-5, seeds 2-5.

PETALS SIMILAR.

Rubus Clarkei.

see Prostrate Herbs, Alternate, Stipulate, Compound.

Potentilla argyrophylla,
ROSACEÆ.
F. B. I. ii. 356.
Himalaya 8-13,000 ft.
Kashmir.
Matiana, Narkanda (Collett).

large, perennial, rootstock very stout, stem velvety, robust; leaves digitately compound, leaflets 3, 2-3 in., sessile or stalked, ovate, coarsely toothed green, and finely hairy above, white-felted beneath, main leaf stalk, 2-3 in., stem stipules united at the leaf stalk, ovate-oblong, short pointed; flowers ¾-1¼ in. diam., yellow or dark purple in terminal branched racemes, bracteoles 5, oblong, blunt, short or

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS SIMILAR.

long pointed, calyx silky, persistent, lobes 5, alternating with the bracteoles, long-pointed, petals 5, heart-shaped with the notch outwards, stamens many, styles lateral, short, persistent; carpels very many, small, crowded on a small dry receptacle, fruit is a head of many hard smooth achenes, covered by the overlapping calyx lobes, achenes one-seeded.

LEAFLETS MANY.

PETALS DISSIMILAR.

Indigofera hirsuta,
LEGUMINOSÆ.
F. B. I. ii. 98.
The Plains to 4,000 ft.

large, annual or biennial, densely hairy, with flat-lying hairs; leaves pinnate, 2-5 in., shortly stalked, leaflets 5-11, 1-2 in. long, opposite, ovate with a broad tip, membranous, grey-green, stipules bristle-like, feathered; flowers $\frac{1}{5}$ in., red in dense slender hairy axillary racemes 2-6 in., long, bracts minute, calyx $\frac{1}{8}$ in., densely velvety, teeth 5, bristle-like, long feathered, petals 5, not much longer than the calyx, soon falling off, standard ovate with a broad tip, keel petals united, straight, not beaked, spurred on each side near the base, stamens 10, upper free, the rest united, anthers tipped with a minute point, style smooth, incurved; pod $\frac{1}{2}$-$\frac{3}{4}$ in. long, cylindrical, densely velvety, 6-8 seeded.

Indigofera anabaptista,
LEGUMINOSÆ.
F. B. I. ii. 102.
The Plains.

small, annual, branches spreading, covered thinly with hairs like those of the last species, but always white; leaves pinnate, shortly stalked, leaflets 3-7, opposite, $\frac{1}{2}$-1 in. long, lanceolate with a broad tip, stipules bristle-like, presistent; flowers $\frac{1}{6}$ in., scarcely longer than the calyx, in short dense, 12-20 flowered racemes, calyx $\frac{1}{8}$ in. silvery haired, teeth bristly, pod linear, reflexed; in other respects like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Tephrosia purpurea,
Sarphanki.
LEGUMINOSÆ.
F. B. I. ii. 112.
The Plains to 6,000 ft.
Simla (Collett).
Baluchistan (Hughes-Buller.)

medium size, perennial, much branched, stems slender, cylindrical ; leaves 3-6 in., pinnate, shortly stalked, stipules linear-awl-shaped, leaflets 13-21, narrow, lanceolate with a broad tip, blunt, green, smooth above, silky beneath ; flowers $\frac{1}{4}$-$\frac{3}{8}$ in., red, thinly silky in leaf opposed loose-flowered racemes, 3-6 in. long, bracteoles minute, calyx $\frac{1}{8}$-$\frac{1}{6}$ in., silky, teeth 5, two upper teeth longer than the three lower, petals 5, $\frac{1}{4}$-$\frac{3}{8}$ in., standard circular, silky without keel, petals united, blunt, stamens 10, upper free, others united, style curved, smooth, tuft of hairs at the tip ; pod $1\frac{1}{2}$-2 by $\frac{1}{3}$ in. sessile, velvety, flat, seeds 6-10.

Tephrosia villosa,
LEGUMINOSÆ.
F. B. I. ii. 113.
The Plains.

small, perennial, stems zigzag, woody, finely downy with white flat-lying hairs ; leaves 2-3 in. long, nearly sessile, stipules linear, ascending or reflexed, leaflets 13-19, grey green, nearly smooth above, silky below, narrow lanceolate with the tip broad and often notched ; flowers $\frac{3}{8}$ in., red in racemes, six or more inches long, lower flowers in distant separate clusters of stalks, bracts bristle-like, feathered, calyx $\frac{1}{5}$-$\frac{1}{4}$ in., very silky, teeth 5, bristle-like, lower longer than the calyx tube, petals 5, not much longer than the calyx, stamens and style as in the last species, pod 1-$1\frac{1}{4}$ in. long., $\frac{1}{6}$-$\frac{1}{5}$ in. broad, densely velvety, curved, sharply bent down.

Tephrosia pauciflora,
LEGUMINOSÆ.
F. B. I. ii. 114.
The Plains.
Baluchistan (Lace.)

very like the last species, but leaflets 5-9, flowers stalked in pairs in the axils of leaves.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Sesbania aculeata,
Jayanti.
LEGUMINOSÆ.
F. B. I. ii. 115.
The Plains.
Baluchistan (Lace.)

large, annual, shrub-like, branches and under surface of leaf midribs armed with small hooked prickles; leaves 6-12 in., leaflets more numerous and smaller than those of *Sesbania ægyptiaca*, see Shrubs, leaflets 41-81, smooth; flowers $\frac{3}{8}$-$\frac{1}{2}$ in., pale yellow dotted with red, in stalked loosely 3-6 flowered racemes, calyx 5-toothed, $\frac{1}{8}$ in., smooth, teeth short triangular, petals 5, stalked, standard petal broad, keel blunt, stamens 10, upper free, others united, style thread like, smooth, incurved, pod 6-9 in., linear, slightly curved, beaked, smooth; seeds many.

Astragalus Falconeri.
LEGUMINOSÆ.
F. B. I. ii. 120.
Hazara (Winterbottom).

large, perennial, stems almost woody, zigzag, velvety, white when young; leaves 1-1$\frac{1}{2}$ in., midrib ending in a point or leaflet, stipules broad, leaf-like, leaflets 13-17, $\frac{1}{4}$-$\frac{1}{2}$ in. long, lanceolate oblong, with broad tips, blunt; flowers $\frac{1}{2}$ in., lilac, in long stalked few-flowered racemes, calyx $\frac{1}{6}$ in., pouched, nearly smooth, teeth 5, very short, petals 5, wing petals short-pointed equal to the keel petals, stamens 10, upper one free, others united, style incurved, smooth, pod $\frac{1}{2}$-$\frac{5}{8}$ in., narrowed to both ends, stalk twice as long as the calyx, 4-6 seeded.

Astragalus trichocarpus,
LEGUMINOSÆ.
F. B. I. ii. 121.
Eastern Punjab.
Himalaya 5-8,000 ft.
Simla (Collett).
Dharmpur.

large, perennial, nearly smooth, branches straight, twiggy, much furrowed; leaves 2-4 in., nearly sessile, midrib ending in a point or leaflet, stipules minute, leaflets 31-41, $\frac{1}{8}$-$\frac{5}{8}$ in., nearly blunt, pale green, covered with minute silvery hairs; flowers $\frac{1}{3}$ in., lilac crowded in stalked racemes, 3-4 in. long, bracts linear, minute calyx $\frac{1}{12}$ in., bell-shaped, oblique, smooth, teeth 5, triangular, petals 5, standard petal round, wings lanceolate shorter than the keel petals, stamens 10, upper free, others united, pod $\frac{3}{4}$-1, stalked, oblong velvety, seeds 4-6.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus ciliolatus,
LEGUMINOSÆ.
F. B. I. ii. 129.
Himalaya, 6-9,000 ft.
Kashmir.

medium size, perennial, stems hollow, smooth; leaves 6-9 in., midrib ending in a point or leaflet; leaflets 17-19, $\frac{1}{2}$-$1\frac{1}{2}$ in., oblong, blunt, green, smooth, stipules $\frac{1}{4}$-$\frac{1}{2}$ in., lanceolate or triangular, free persistent; flowers $\frac{3}{4}$ in., yellow tinged with lilac, crowded nearly all on one side of long-stalked racemes, bracts linear, shorter than the buds, calyx $\frac{3}{8}$ in., tubular, oblique, teeth 5, bristle-like, feathered, petals 5, keel shorter than the standard and wing petals, broad, abruptly upcurved, stamens and style like those of the last species; pod 1 in., oblong, expanded, narrowed into a beak, covered with fine short spreading black hairs, stalk $\frac{3}{8}$ in., seeds 8-20.

Astragalus frigidus,
LEGUMINOSÆ.
F. B. I. ii. 130.
Lahoul.

medium size, perennial, stout, smooth; leaves 4-6 in. long, stipules $\frac{1}{2}$-$\frac{3}{4}$ in. long, ovate or lanceolate, sharp-pointed or blunt, free, persistent, leaflets 9-15, oblong, one or more inches long, opposite, thin, smooth above, with a bluish waxy gloss and a few hairs below; flowers $\frac{3}{4}$ in., bright yellow arranged nearly all one side on long stalked racemes, calyx $\frac{3}{8}$ in., tubular, with a few flat-lying hairs, teeth 5, minute, petals 5, standard longer than the wings and keel petals, stamens and style as those of the last species; pod 1 in., expanded, smooth, oblong, stalked, narrowed to both ends, 6-8 seeded.

FLOWERS, IN HEADS, IN THE NEXT SEVEN SPECIES OF ASTRAGALUS, AND TWO OF OXYTROPIS.

Astragalus prolixus,
LEGUMINOSÆ.
F. B. I. ii. 121.
The Plains.
Lahore.

small, annual weed, clothed densely with horizontal-lying white hairs, very slender; leaves $\frac{1}{2}$-$1\frac{1}{2}$ in., distinctly stalked, stipules free, minute, lanceolate, leaflets 11-17, oblong, blunt, $\frac{1}{8}$-$\frac{1}{4}$ in., covered with the horizontal white hairs; flowers $\frac{1}{10}$ in. yellow 6-12 together in heads on stalks a little shorter than the leaves, calyx less than $\frac{1}{12}$ in., densely matted, teeth 5, linear-bristle-like, nearly equal to the calyx tube petals, stamens and style

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

as above; pod $\frac{1}{4}$-$\frac{3}{8}$ in., sessile expanded, densely velvety, straight, linear-oblong, 6-8 seeded.

Astragalus Aitchisoni,
LEGUMINOSÆ.
F. B. I. ii. 121.
Salt range (Aitchison).
Pindigheb.
Rawalpindi District (Douie).

small, annual weed, slender, thinly covered with white hairs; leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in., distinctly stalked, stipules triangular, minute, leaflets 17-25, $\frac{1}{2}$ in., alternate, wide apart, grey green, a few short horizontal white hairs; flowers $\frac{1}{3}$ in., white with a purple tip, in a loose head of 4-6 flowers on a short stalk, bracts minute, calyx $\frac{1}{6}$ in., bell-shaped, thinly white silky, teeth 5, linear or lanceolate, petals 5, standard longer than the wings and keel, stamens and style as those in the last species; pod $1\frac{1}{2}$ in., slender, straight or slightly curved, slightly clothed with white hairs, 15-20-seeded, seeds very small.

Astragalus contortiplicatus,
LEGUMINOSÆ.
F. B. I. ii. 122.
The Plains.
Baluchistan (Boissier.)

small, annual weed, covered with short, soft, spreading white hairs; leaves 3-4 in., distinctly stalked, stipules small, free, lanceolate, leaflets 13-17 oblong-lanceolate with a broad and notched tip. $\frac{1}{4}$-$\frac{1}{2}$ in., wide apart, greenish, soft scattered hairs on both sides; flowers $\frac{1}{5}$ in., yellow in dense many-flowered heads on stalks, with few scattered soft hairs, much shorter than the leaves, calyx $\frac{1}{6}$ in., with a few scattered soft hairs, teeth 5, bristle-like, feathered, petals 5, projecting a little from the calyx, wings lanceolate, short-pointed, shorter than the standard and keel, stamens and style like those in the last species; pod $\frac{1}{2}$ in., cylindrical, much recurved, sausage-shaped, folded lengthwise, wrinkled, 20-30 seeded.

Astragalus melanostachys,
LEGUMINOSÆ.
F. B. I. ii. 125.
Himalaya, 10-15,000 ft.
Kashmir.
Lahoul.

medium size, perennial, fairly stout, smooth; leaves 1-3 in., distinctly stalked, stipules $\frac{1}{4}$-$\frac{3}{8}$ in., leafy, free, triangular with a sharp hard point, leaflets 13-15, oblong, green with a bluish waxy gloss, blunt or notched; flowers $\frac{1}{5}$-$\frac{1}{4}$ in., lilac or purple in crowded heads, 1-3 in. long, stalks 2-6 in., covered with short spreading black and also white hairs, dense just below the head, calyx $\frac{1}{6}$-$\frac{1}{5}$ in., covered with black silky hairs, teeth 5, equal to the tube, nearly sessile, petals 5, contracted, keel and wings shorter than the standard, stamens and style like those of the last species; pod $\frac{1}{5}$ in., oblong, sessile, black, silky, two-seeded.

Astragalus cashmirensis,
LEGUMINOSÆ.
F. B. I. ii. 127.
Kashmir 9-10,000 ft.
(Falconer).

small, perennial, stems stout, shaggy with long hairs; leaves 3-4 in., distinctly stalked, stipules $\frac{1}{2}$ in., lanceolate, thin, free, marked with lines, leaflets 29-33, oblong blunt, or short-pointed, $\frac{3}{8}$-$\frac{1}{2}$ in., crowded, dull, densely clothed at first with fine long hairs; flowers $\frac{3}{4}$ in., yellow in dense round heads on stalks 1-3 in., bracts $\frac{1}{4}$-$\frac{3}{8}$ in., linear, feathered; persistent, calyx $\frac{3}{8}$-$\frac{1}{2}$ in., thinly covered with long hairs, teeth 5, linear, petals 5, standard longer than the wings and keel, stamens and style like those of the last species; pod $\frac{1}{2}$ in., linear-oblong, straight, sessile, finely velvety, hollowed down the keel, narrowed into a long beak, 6-8 seeded.

Astragalus leucocephalus,
LEGUMINOSÆ.
F. B. I. ii. 128.
Himalaya 1-7,000 ft.
Simla, Naldera
(Collett).
Murree (Douie).
Sakesar, Salt range.

small, perennial, densely covered with silvery white hairs, stems slender short; leaves 1-3 in., stipules small, leaflike, united below the middle, leaflets $\frac{1}{8}$-$\frac{1}{4}$ in., oblong, 21-31, thick, blunt or nearly short-pointed, close to each other, covered with silvery white hairs; flowers $\frac{1}{4}$ in., pale yellow in small very dense, oblong heads on densely white felted stalks, 2-6 in., bracts lanceolate, longer than the buds, calyx $\frac{1}{6}$ in., shaggy with white hairs, nearly sessile, teeth 5, bristle-like, equal to the calyx tube, petals 5, keel shorter than the standard and wings, stamens and style like those of the last species; pod $\frac{1}{6}$ in., oblong, sessile, finely downy, 3-4 seeded.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus Munroi.
LEGUMINOSÆ.
F. B. I. ii. 128.
Spiti, Lahul.

small, perennial, rootstock stout, long, woody, spindle-shaped, stems of a tuft of shoots from the base, stout, shaggy with dense spreading white hairs; leaves $1\frac{1}{2}$-2 in., stipules $\frac{1}{2}$ in., linear or lanceolate, free, leaflets 19-21, $\frac{3}{4}$-1 in., lanceolate with a broad blunt tip, thinly covered with loose white hairs; flowers $\frac{3}{4}$-$\frac{7}{8}$ in., yellow, in few-flowered sessile axillary heads, calyx $\frac{1}{2}$-$\frac{5}{8}$ in., thinly velvety, teeth 5, linear, bristle-like, petals 5, nearly equal, stamens and style like those of the last species; pods oblong, sessile 1 in. long, inflated, 10-12 seeded.

Oxytropis lapponica.

see Herbs, Unbranched, Alternate, Stipulate, Compound.

Oxytropis cachemirica,
LEGUMINOSÆ.
F. B. I. ii. 139.
Kashmir 8-10,000 ft.

small, perennial, rootstock woody, stem short finely velvety; leaves 1-2 in., stipules lanceolate or triangular, united below, leaflets 13-21, oblong lanceolate, $\frac{3}{8}$-$\frac{1}{2}$ in., densely white silky; flowers $\frac{1}{2}$ in., yellow, rarely purple in dense heads, 12-30 flowered, on long stalks, bracts distinct, lanceolate, calyx $\frac{3}{8}$ in., densely white silky, teeth 5, linear, nearly equal, petals 5, standard longest, keel shortest with a distinct point, stamens 10, one free, others united, style abruptly incurved, beardless; pod $\frac{3}{8}$-$\frac{5}{8}$ in., sessile, much inflated, shaggy with loose dense white silky hairs, round-oblong, 5-6 seeded.

Oxytropis Meinshausenii,
LEGUMINOSÆ.
F. B. I. ii. 139.
Himalaya 9-11,000 ft.
Valley of Kishengunga.

small, perennial, stem distinct, at first thinly covered with soft scattered hairs; leaves 3-4 in., stipules $\frac{1}{4}$-$\frac{1}{2}$ in., free, lanceolate or oblong, leaflets 17-31, $\frac{1}{2}$-$\frac{3}{4}$ in., oblong, blunt, green, slightly covered with long whitish hairs on both surfaces, flowers $\frac{3}{4}$ in., yellow, rarely purple in a dense 12-20 flowered head on erect stalks, 4-6 in., bracts $\frac{1}{8}$-$\frac{1}{4}$ in., linear, covered with scattered black

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

hairs, calyx $\frac{3}{8}$ in., tubular, thinly covered with horizontal black hairs, teeth 5, linear, feathered in black, petals, stamens and style like those in the last species; pod $\frac{1}{4}$-$\frac{3}{8}$ in. oblong, expanded, straight, short-stalked, with a few silky black hairs 6-8 seeded.

Onobrychis Stewartii.
LEGUMINOSÆ.
F. B. I. ii. 141.
The Plains.
Hazara (Stewart).
Rawalpindi (Aitchison)
Kot Futteh Khan.
Rawalpindi District.
(Douie).

medium size, annual, stem slender, becoming smooth; leaves 3-4 in., including stalk, stipules linear, minute, leaflets 9-11, $\frac{1}{2}$-$\frac{3}{4}$ in. long, lanceolate with broad tip, nearly short-pointed, wide apart, somewhat hairy; flowers red, $\frac{1}{3}$ in., in long stalked axillary racemes, 6-9 in., bracts linear, minute; calyx $\frac{1}{12}$ in., bell-shaped, silky, teeth 5, lanceolate, petals 5, standard broad, smooth, veined, wings short, keel blunt, stamens 10, all united, style thread-like, incurved; pod $\frac{1}{6}$-$\frac{1}{3}$ in., kidney-shaped, expanded, faces woody, deeply honey-combed, edge armed with close minute spines, one-seeded. Douie found the stipules larger than minute, and the stamens not all united.

Hedysarum astragaloides.
LEGUMINOSÆ.
F. B. I. ii. 146.
Himalaya 11-12,000 ft.
Kishtwar (Thomson).
Lahul (Jaeschke).

medium size, stems robust, becoming grey velvety at first; leaves including the stalk, 4-8 in. long, leaflets 21-29, $\frac{3}{4}$-1 in., linear-oblong, blunt with a minute point, smoothish above, persistently grey velvety beneath; flowers $\frac{3}{4}$ in., red in very dense racemes 2-3 in. long, bracts linear thin projecting beyond the buds, calyx $\frac{1}{4}$ in., bell-shaped, finely silky, teeth 5, petals 5, standard shorter than the keel, keel blunt, stamens 10, upper free, lower ones united, style thread-like, very long, abruptly bent; pod stalked, distinctly one or two-jointed, joints oblong, thin, with a crisped wing below, less marked one above.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Hedysarum oachemirianum. LEGUMINOSÆ. F. B. I. ii. 146. Kashmir, 9-10,000 ft.	medium size, stem robust, smooth, grooved; leaves including the stalk 6-12 in. long, leaflets 21-27, $\frac{3}{4}$-$1\frac{1}{4}$ in., long, linear-oblong, thin, blunt, both sides green, becoming smooth; flowers $\frac{3}{4}$-1 in., red in very dense racemes, 2-3 in., bracts linear, bristle-like, longer than the buds, calyx $\frac{3}{8}$ in., downy, teeth 5, petals 5, stamens and style as in the last species; pod of 1 to 3 joints, $\frac{1}{2}$-$\frac{3}{4}$ in. long, oblong, smooth, both sutures with a distinct uncrisped wing.
Hedysarum laxiflorum. LEGUMINOSÆ. F. B. I. ii. 146. Himalaya, 9-12,000 ft. Valley of Kishengunga (Winterbottom).	medium size, stems slender, firm, smooth; leaves including stalk, 3-5 in., leaflets 21-31, linear oblong, close, firm, nearly leathery, smooth above, grey, barely covered with grey velvet beneath; flowers $\frac{5}{8}$-$\frac{3}{4}$ in., red in loose racemes, 2-3 in., bracts minute bristle-like, calyx $\frac{1}{6}$ in., teeth 5, upper triangular, lower lanceolate, pod 3-4 jointed oblong, firm, smooth, rather expanded, not more than $\frac{1}{6}$ in., long; otherwise like the last species.
Hedysarum strobiliferum. LEGUMINOSÆ. F. B. I. ii. 146. Kashmir, 9,000 feet (Falconer).	small, stem robust, thickly covered with short horizontal whitish hairs; leaves including the stalk, 6-8 in., leaflets 19-25, oblong-lanceolate, 1-$1\frac{1}{2}$ in., blunt, smoothish above, somewhat white-silky beneath; flowers less than $\frac{1}{2}$ in., yellowish, in dense racemes, 2-3 in., bracts overlapping, thin, dry, stiff, bristly quite hiding the buds, calyx $\frac{1}{5}$-$\frac{1}{4}$ in., tubular, teeth 5, short, triangular with sharp hard points petals 5, equal; stamens and style as in the last species.
Hedysarum microcalyx. LEGUMINOSÆ. F. B. I. ii. 147. Himalaya, 9,000 ft. Kashmir. Lahul.	medium-size, stems stout, smooth, furrowed, leaves including the stalk, 6-9 in., leaflets 11-13, oblong-lanceolate, 1-$1\frac{1}{2}$ in., wide apart, blunt, both sides green, smooth; flowers $\frac{5}{8}$-$\frac{3}{4}$, bright red, in loose racemes, 2-4 in., calyx $\frac{1}{8}$ in., bell-shaped, smooth, thin, teeth 5, minute, triangular with a

hard sharp point, petals 5, keel longer than standard, stamens and style as in the last species; pod 2-3 jointed, $\frac{1}{2}$-$\frac{5}{8}$ in., oblong, thin, smooth, both sutures distinctly margined.

Smithia sensitiva,
Oda-brini.
LEGUMINOSÆ.
F. B. I. ii. 148.
The Plains.

medium-size, annual, stems very slender, not bristly, much branched; leaves including stalk $\frac{1}{2}$-1 in., midrib bristly, stipules thin, dry with processes at the base, leaflets 4-20, $\frac{1}{4}$-$\frac{1}{2}$ in. long, sensitive, oblong, blunt, bristly on the midrib beneath and along the almost straight margins; flowers $\frac{2}{5}$ in., yellow, 1-6 in short stalked axillary racemes, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., 2-lipped, lips entire, short-pointed, with a few scattered pale yellow bristles, petals 5, standard circular, keel incurved, blunt, stamens 10, in two bundles of five, style thread-like, incurved; pod of 4-6 joints, joints covered with minute nipple-like projections, folded together inside the calyx. This plant is eaten as a potherb, and forms a useful fodder.

Smithia geminiflora,
LEGUMINOSÆ.
F. B. I. ii. 149.
Himalaya, 1-3,000 ft.

very like the last species, but with fewer leaflets, more bristles on the midribs and margins of leaflets, and the flowers in pairs in the axils of leaves.

Smithia ciliata,
LEGUMINOSÆ.
F. B. I. ii. 150.
Himalaya, 3-6,000 ft.
Simla, Naldera
(Collett).

small to medium-size, annual, stem slender, not bristly; flowers in dense shortly stalked one-sided axillary racemes, bracteoles leafy, oblong with scattered bristles, calyx upper lip sharply cut off, lower lanceolate; otherwise like the two last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Æschynomene indica,
Kath-sola.
LEGUMINOSÆ.
F. B. I. ii. 151.
The Plains to 5,000 ft.
Kashmir.
Valleys below Simla (Collett).
Phalia, Gujrat District (Douie).

large, annual, pale green, stem smooth, branches many, cylindrical, often slightly rough with tubercles; leaves 2-3 in., stalk sticky with glands, stipules linear-lanceolate, long-pointed, with processes at the base, soon falling off, leaflets 41-61, sensitive, very small, upper ones smallest, overlapping, alternate, narrowly oblong, rounded with a small point; flowers $\frac{1}{3}$ in., yellow, often with purple streaks, in many, sticky, axillary racemes, bracts small, lanceolate, fringed with hairs, calyx $\frac{1}{6}$ in., smooth, deeply 2-lipped, lips faintly toothed, petals 5, standard circular, erect, keel nearly straight, blunt, stamens 10 in two bundles of five, style incurved, smooth; pod 1-1½ in. long, linear, stalked, flattened, smooth, straight or rather curved, upper suture straight, lower indented, joints 6-10, smooth or finally rough with nipple-like processes, one seed in each joint. The allied species *Æ. aspera*, yields the pith (sola) from which sun hats are made.

Uraria picta,
Dabra, deter.
LEGUMINOSÆ.
F. B. II. ii. 155.
The Plains to 6,000 ft.

large, perennial, stem finely downy, robust, branches few; leaves 10-12 in. long, lowest simple or of 3 leaflets, rounded or oblong, upper of 5-9 leaflets, mid stalk downy, stipules $\frac{1}{2}$ in., lanceolate, long-pointed, leaflets 4-8 in., linear-lanceolate, leathery, smooth, clouded with white above, net veined, minutely velvety beneath; flowers purple $\frac{1}{4}$ in., in dense cylindrical racemes, 6-12 by $\frac{5}{8}$-$\frac{3}{4}$ in., bracts brown, thin, soon falling off, minor flower stalks bristly, abruptly incurved, after flowering, at the tip, calyx $\frac{1}{5}$ in., tube very short, teeth 5, 2 upper short, lower long, bristle-like, petals 5, standard broad, wings united to the keel, stamens 10, upper one free, lower ones united, style thread-like, sharply bent; pod of 3-6 joints, joints small, swollen, one-seeded, polished, often placed face to face. The seeds are used to cure ulcerated mouths.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Cicer arietinum,
Gram or Chick-pea,
Chana.
LEGUMINOSÆ.
F. B. I. ii. 176.
The Plains to 2,000 ft.
Commonly cultivated.

small, annual, sticky, much branched; leaves 1-2 in., stipules small, obliquely ovate, with a few long teeth, strongly veined, leaflets 13 or so, $\frac{1}{4}$ in. long, ovate or oblong, deeply cut, strongly veined, flowers $\frac{3}{8}$ in., pink, blue or white, solitary axillary on stalks $\frac{1}{2}$-$\frac{3}{4}$ in., calyx $\frac{1}{4}$-$\frac{1}{3}$ in., teeth 5, linear, nearly equal, petals 5, standard broad, longer than the wings and keel, stamens 10, upper free, lower united, style incurved, beardless; pod $\frac{3}{4}$-1 in., swollen, velvety, sessile, narrowed into the persistent style, seeds 2 nearly round, reddish brown, black or white, indented, beaked.

Vicla tetrasperma,
LEGUMINOSÆ.
F. B. I. ii. 177.
Himalaya 6-8,000 ft.

medium size, annual, stem smooth, very slender much branched; leaves $\frac{1}{2}$-1 in., ending in twisted tendrils, stipules large, pointed, often toothed, base ending in a pointed lobe, leaflets 6-12, narrowly oblong, $\frac{1}{3}$-$\frac{3}{4}$ in., blunt or short pointed; flowers $\frac{1}{4}$ in., pale blue, in pairs or rarely solitary on axillary stalks equal in length to the leaves, calyx $\frac{1}{12}$ in., bell-shaped, teeth 5, three lower the longest, petals 5, longer than the calyx, standard broad, erect, keel nearly straight, blunt, shorter than the wing petals, stamens 10, upper one nearly or quite free, others united, style short, incurved, velvety all round; pod $\frac{1}{2}$ in., smooth, oblong, seeds 3 or 4.

Vicia Griffithii,
LEGUMINOSÆ.
F. B. I. ii. 178.
The Plains.
Rawalpindi.
Futtehjang (Aitchison).
Baluchistan (Duthie).

medium-size, perennial, stems slender, finely silky, thin, smooth, straggling; leaves 2 in., ending in twisted tendrils, stipules triangular, deeply cut, leaflets 12-16, $\frac{1}{8}$-$\frac{1}{4}$ in., wide apart, linear-oblong, thin, blunt; flowers $\frac{5}{8}$ in., lilac in 2-4 flowered, axillary racemes, as long as the leaves, calyx $\frac{1}{6}$ in., rather silky, teeth 5, upper triangular, lower lanceolate, pod $1\frac{1}{4}$ in., oblong, flat, smooth, veined, seeds 5-6; otherwise like the last species.

Herbs, erect, with Alternate Stipulate Compound Leaves.

Leaflets Many.

Petals Dissimilar.

Vicia sativa.
Vetch. or Tare.
Leguminosæ.
F. B. I. ii. 178.
The Plains to 7,000 ft.

small to medium size, annual, stems slender spreading or erect, rather downy ; leaves pinnate ending in twisted tendrils, stipules small, obliquely lanceolate, deeply toothed, leaflets 8-12, those of upper leaves $\frac{1}{2}$-1 in. strap shaped, of lower shorter, broader, sometimes deeply notched at the apex ; flowers $\frac{2}{3}$ in. or less, red-blue usually solitary, rarely in pairs, axillary, sessile, calyx $\frac{3}{8}$ in., teeth 5, lanceolate-awlshaped, petals 5, twice the length of the calyx, style bearded below the stigma, pod 1-2 in., smooth, seeds 8-10 ; otherwise like the last species. A weed of cultivation, stated to be sometimes cultivated as a fodder plant.

Vicia peregrina.
Leguminosæ.
F. B. I. ii.
The Plains.

small, annual, slender, smooth, spreading, leaflets 10-12, alternate or opposite, $\frac{1}{2}$-1 in. long, stipules minute, bifid with linear divisions ; flowers $\frac{1}{2}$ in. red purple solitary, on short axillary stalks, calyx $\frac{1}{4}$ in., teeth lanceolate, upper shorter curved upwards ; pods 1-1$\frac{1}{4}$ in., linear-oblong, abruptly turned down, smooth, rather curved, seeds 5-6 ; otherwise like the last species.

Vicia sepium.
Leguminosæ.
F. B. I. ii. 179.
Kashmir.

medium-size, perennial, finely downy ; leaflets oblong, abruptly ended, stipules small, deeply toothed, flowers $\frac{2}{3}$ in., reddish in 2-6 flowered, nearly sessile, one-sided, racemes only in the axils of upper leaves, calyx $\frac{1}{3}$ in., smooth or downy, teeth triangular with a sharp hard point, pod 1 in., oblique, smooth, beaked, seeds 6-10 ; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Vicia narbonensis.
LEGUMINOSÆ.
F. B. I. ii. 179.
Peshawar (Vicary)
The Park at Rawalpindi.

medium-size, annual, stout, smooth or finely downy; leaflets 2 on the lowest leaves, 4-6 on the upper, 1-2 in. long, entire, obovate, stipules large, deeply cut; flowers $\frac{7}{8}$ in., purple and white, in nearly sessile 2-6 flowered racemes, calyx $\frac{3}{8}$ in., upper teeth triangular, lower lanceolate; pod $1\frac{1}{2}$-2 in., downy, 6-7 seeded; otherwise like the last species.

Vicia Faba.
Broad bean.
Bakla, chastang.
LEGUMINOSÆ.
F. B. I. ii. 179.
The Plains to 8,000 ft.

very like the last species, but larger. It is cultivated widely as a vegetable, and possibly may have once originated from *Vicia narbonensis.*

Lens esculenta.
Lentil.
Masur dal.
LEGUMINOSÆ.
F. B. I. ii. 179.
The Plains.
Baluchistan (Hughes-Buller.)

small, annual, softly velvety, branching from the base; leaves terminating in a bristle, stipules almost lobed at the base, leaflets 8-12, entire, lanceolate, often tipped with a small sharp point, sessile; flowers pale purple in 2-4 flowered racemes on stalks equal to the leaves, the end of the stalk extending beyond the flowers, calyx teeth linear, silky, petals 5, standard broad, wings joined to the keel, keel shorter than the wings, stamens 10, united into a tube with an oblique mouth, style abruptly bent, bearded on its inner face; pod $\frac{1}{2}$ in., long, oblong, flattened, smooth, seeds 2, grey with minute spots, flattened.

Lathyrus altaicus.
LEGUMINOSÆ.
F. B. I. ii. 180.
Himalaya 6-8,000 ft.
Chenab Valley (Royle.)

small, perennial, glabrous; leaves 2-3 in., terminated by a long tendril, stipules lanceolate with a tail-like point, slightly toothed, leaflets 6-8, $\frac{1}{2}$-$\frac{3}{4}$ in., broad, oblong, thin, with a bluish waxy gloss; flowers reddish, $\frac{3}{4}$ in., in 3-6-flowered loose one-sided racemes on stalks, 2-4 in. long, calyx $\frac{3}{8}$ in., 5-toothed, upper teeth triangular, lower linear,

Herbs, erect, with Alternate Stipulate Compound Leaves.

Leaflets Many.

Petals Dissimilar.

petals 5, standard broad, keel shorter than the wings, stamens 10, upper free, others united, style flattened, bearded on the inner side, pod cylindrical or flattish.

Lathyrus luteus.
Leguminosæ.
F. B. I. ii. 180.
Himalaya.
8-10,000 ft.
Mashobra.
Mahasu, Matiana.
Huttu (Collett).
Salt range.

medium-size, perennial, smooth; leaves 3-5 in., ending in a bristle, stipules large, leafy, base 2-lobed, leaflets 6-8, 2-4 in. long, thin, short-pointed, pale green; flowers 1 in., yellow, in 6-12-flowered stalked racemes, equal to or longer than the leaves, calyx $\frac{3}{8}$-$\frac{1}{2}$ in., teeth 5, upper triangular, lower lanceolate, pod 2-3 in., linear, beaked, seeds many; otherwise like the last species.

Phaseolus mungo,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Phaseolus calcaratus,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Petals Similar.

Cassia occidentalis,

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Sophera,

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Tora or obtusifolia,
Panwar.
Leguminosæ.
F. B. I. ii. 263.
The Plains to 5,000 ft.
Naldera.
Sutlej Valley (Collett)
Kangra Valley.

large, annual, shrub-like, not fœtid; leaves 2-4 in., stalked, stipules $\frac{3}{4}$ in., linear, soon falling off, main leaf-stalk grooved, conical gland between the lowest pair of leaflets, leaflets 6, 1-2 in. long, oblong-ovate with a broad triangular tip, obliquely rounded at the base, thin, green, smooth or rather velvety on both surfaces; flowers $\frac{1}{2}$ in. long, bright yellow in nearly sessile axillary pairs, calyx divided into 5 nearly to the base, lobes green, petals 5, nearly equal, stamens 10, 7 perfect, 3 minute,

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

abortive, style incurved; pod 8-10 in., nearly cylindrical, divided by oblique partitions, sutures broad, seeds 30-35, flattened, brown shining. The leaves, seeds and root are used medicinally. It is a very common weed which flowers during the rains.

Cassia obovata or obtusa.
Indian Senna.
LEGUMINOSÆ.
F. B. I. ii. 264.
The Plains.
Delhi, Salt Range.
Derajat.
Baluchistan (Boissier).

medium-size, annual or perennial, nearly smooth, branches angular; leaves 2-3 in., stalked, no gland between the leaflets, stipules lanceolate, persistent leaflets 8-12, ½-1½ in. long, oblong-ovate with a broad tip, rounded with a minute point, thin, a waxy bluish gloss beneath; flowers ¾ in., pale yellow in narrow few-flowered stalked racemes, 2-3 in., calyx segments blunt, smooth, stamens very unequal, pods 1-1½ in. long, shortly stalked, much curved; rounded at the ends, flexible smooth, seeds 6-12, separated by very thin partitions: otherwise like the last species.

Cassia absus.
Chaksu.
LEGUMINOSÆ.
F. B. I. ii. 265.
The Plains to 5,000 ft.
Valleys below Simla (Collett).
Dharmpur.

medium-size, annual or biennial, covered with grey sticky hairs; leaves 1½-3 in., long-stalked, a small gland on the main stalk between every pair of leaflets, stipules small, linear, persistent, short-pointed, leaflets 4, 1-2 in. long, oblong, blunt or nearly short-pointed, unequal at the base, hairy beneath as well as above; flowers ¼ in. diam., red-yellow in few flowered erect narrow short racemes, calyx of 5 narrow segments, ⅙-⅕ in. long, lanceolate, bristly, petals 5, nearly equal with long stalks, veined, stamens 5, equal, perfect; pod 1-1½ in., trap-shaped, oblique, seeds 5, flattened, dark-brown, shining.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Spiræa aruncus,
Meadow sweet.
ROSACEÆ.
F. B. I. ii. 323.
Himalaya, 8-10,000 ft.
Hattu (Collett).

large, perennial rootstock, shrub-like, smoothish; leaves 6-12 in., 2 to 3-pinnate, long primary and secondary leaf-stalks, leaflet-stalks short, stipules rudimentary, leaflets usually in threes, 1-3 in. long, ovate, sharply and irregularly toothed, narrowed into a tail-like tip; flowers ⅙-¼ in., many, white, one sexual, male and female on different plants, in long slender velvety branching racemes, calyx persistent, lobes 5, oblong, ovate, petals 5, orbicular, stamens 20 or more, sometimes united below, styles 5 or more, nearly terminal; follicles 6 or more, swollen, smooth, shining, seeds few. This plant is often mistaken for *Astilbe rivularis*, but the latter has no petals.

la albifolia,
ROSACEÆ.
F. B. I. ii. 347.
Himalaya, 8-10,000 ft.
Hattu, Bhagi (Collett).

small, perennial, rootstock stout, stems several, slender, zigzag, velvety, branched; leaves 2-4 in., pinnate, stalk very slender, stipules ½-¾ in., sheathing, loose, brown, short-pointed, united for half their length to the stalk, leaflets 5-9, ¼-1 in., ovate, deeply and sharply toothed, lateral leaflets diminishing from the uppermost pair downwards, green, velvety above, white-felted beneath; flowers ¼ in. diam., yellow, solitary on slender axillary stalks, 1-2 in., calyx persistent, tube shallow with 5 lobes, alternating with 5 bracteoles, white-felted, lobes triangular, bracteoles linear-oblong, petals 5, oblong, shorter than the calyx lobes, stamens 5, styles many, achenes many forming a head, hairy, covered by the calyx lobes, large, deeply furrowed, receptacle felted.

Potentilla fulgens,
ROSACEÆ.
F. B. I. ii. 165.
Himalaya, 6-9,000 ft.
Simla.
Mashobra (Collett).

small, perennial, rootstock stout, stem leafy, softly silky; leaves 2-8 in., pinnate, stalk stout, lower stipules dry, thin, upper leafy, toothed or lobed, leaflets many, in large and small pairs alternately, decreasing in size from above downwards, ovate, sharply toothed, terminal leaflet 1-1½ in.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

green, hairy above, silvery felted beneath; flowers $\frac{1}{2}$ in. diam., yellow crowded in terminal clusters or branched racemes, bracteoles quite entire or 2-3-fid, calyx silvery hairy, lobes ovate, short-pointed, petals orbicular, ovate with a broad tip, stamens many, styles short, slender, ventral, achenes, small, smooth; otherwise like the last species.

Potentilla Clarkei.
ROSACEÆ.
F. B. I. ii. 351.
Himalaya 7,000 ft.
Srinagar,
Kashmir (Clarke).

small, perennial, rootstock woody, stem stout, ascending, leafy, rough with long spreading hairs; leaves 1-2 in., covered with spreading hairs, stipules on the stem, leafy, large, half ovate, entire or toothed, leaflets $\frac{1}{2}$-1 in., 5-7, ovate with a broad tip, very coarsely round-toothed, $\frac{1}{3}$ way down, sessile, close together; flowers $\frac{1}{2}$ in. diam., yellow stalked, very stiff in clusters with very spreading leafy branches and bracts; calyx lobes short-pointed, petals ovate with a broad tip, stamens many, styles slender, terminal, achenes many, large minutely wrinkled on a raised hairy receptacle; otherwise like the last species.

Potentilla sericea.
ROSACEÆ.
F. B. I. ii. 354.
Himalaya 9-17,000 ft.
Kashmir.

small to medium-size according to elevation, rootstock erect, very stout, stems many, white, densely silky-felted; leaves 1-6 in., crowded about 1 in. broad, leaflets 5-11, oblong, silky on both surfaces, all cut nearly to the midrib, terminal leaflets radiating, lateral, opposite and alternate; flowers $\frac{1}{4}$-$\frac{3}{4}$ in. diam., yellow on flowering stems, densely felted, in many or few flowered clusters or solitary, calyx lobes triangular-ovate or lanceolate bracteoles narrowly oblong, blunt, petals orbicular, ovate with a broad tip, styles terminal, achenes many, smooth; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Potentilla nepalensis, *Rattanjot,* ROSACEÆ. F. B. I. ii. 355. Himalaya, 5-9,000 ft. Simla (Collett). Murree.	medium-size, perennial, stout or slender, softly hairy to nearly smooth, stem branched, leafy; leaves digitately compound, radical 12 by 3 in., long-stalked, leaflets 5, 1-3 by $\frac{1}{4}$-$1\frac{1}{4}$ in., sessile, stem stipules $\frac{3}{4}$-1 in., ovate or oblong, lower entire, upper lobed, leaflets ovate with a broad tip or rounded, coarsely toothed, green; flowers $\frac{2}{3}$-1 in. diam., purple, stalked in forked branching racemes, calyx lobes short-pointed, bracteoles blunt, petals reversed heart-shaped, longer than the calyx lobes, achenes very many, minute, wrinkled on a round hairy receptacle; otherwise like the last species.
Potentilla kashmirica, ROSACEÆ. F. B. I. ii. 355. Kashmir, 7,500 ft. Nowgunge (Clarke).	very like the last species, but with shorter leaf stalks, shorter more deeply toothed leaflets, yellow flowers, more deeply wrinkled achenes, and broadly clustered flowers.
Potentilla argentea,	see Herbs, Unbranched, Alternate, Stipulate, Compound.
Agrimonia eupatorium,	see Herbs, Unbranched, Alternate, Stipulate, Compound.
Agrimonia pilosa,	see Herbs, Unbranched, Alternate, Stipulate, Compound.

FLOWERS, MINUTE, IN UMBELS.

Vicatia coniifolia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Vicatia millefolia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Elaeosticta meifolia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Apium graveolens,	see Herbs, Erect, Alternate, Exstipulate, Compound.

Herbs, erect, with Alternate Stipulate Compound Leaves.

Leaflets Many.

Petals Similar.

Flowers, Minute, in Umbels.

Cicuta virosa,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Carum Carui,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Carum Bulbocastanum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Carum Roxburghianum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Carum copticum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Sium latijugum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pimpinella saxifraga,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pimpinella acuminata,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pimpinella diversifolia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Osmorrhiza claytoni	see Herbs, Erect, Alternate, Exstipulate, Compound.
Chœrophyllum virosum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Chœrophyllum reflexum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Chœrophyllum capnoides,	see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Chœrophyllum cachemiricum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Scandix Pecten-Veneris,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Anthriscus nemerosa,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Seseli sibiricum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pycnocycla glauca,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Fœniculum vulgare,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Prangos pabularia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Ligusticum marginatum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum tenuifolium.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum papyraceum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum Candolii,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum vaginatum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum Govanianum,	see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Pleurospermum Candolii,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum angelicoides,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum stylosum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum densiflorum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum Brunonis,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Angelica glauca,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Archangelica officinalis,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Ferula Thomsoni,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Ferula Jœschkeana,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Peucedanum graveolens,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Peucedanum Thomsoni,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Heracleum Thomsoni,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Heracleum pinnatum,	see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Heracleum cachemiricum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Heracleum canescens.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Heracleum candicans.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Zosimia absinthifolia.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Coriandrum sativum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Cuminum Cyminum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Daucus Carota,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Caucalis Anthriscus,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Caucalis leptophylla.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Caucalis latifolia.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Psammogeton biternatum,	see Herbs, Erect, Alternate, Exstipulate, Compound.

PETALS NONE.

Thalictrum cultratum,	see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS NONE.

Thalictrum reniforme. see Herbs, Erect, Alternate Exstipulate, Compound.

Thalictrum Javanicum. see Herbs, Erect, Alternate, Exstipulate, Compound.

Thalictrum foliolosum. see Herbs, Erect, Alternate, Exstipulate, Compound.

Astilbe rivularis.
SAXIFRAGACEÆ.
F. B. I. ii. 389.
Himalaya, 4-9,000 ft.
Simla, Mashobra (Collett).
Kashmir.
Dalhousie.

large, rootstock perennial, hairy; leaves 6-18 in., irregularly 2-pinnate, stipules large, thin, united to the leaf stalk, sheathing, base of leaf stalk enlarged, hairy, leaflets 1-4 in., ovate, sometimes lobed, heart-shaped at the base, sharply toothed, long-pointed, smooth above, minutely bristly beneath along the midrib and nerves; flowers very small, greenish-yellow, sometimes one sexual in spicate racemes, forming a large terminal branching raceme, 12-24 in. long, stalk of raceme softly hairy, calyx bell-shaped, united to the base of the ovary, lobes 5, deeply divided, persistent, petals none, stamens 5, opposite the sepals, styles 2; capsule small 2 beaked, seeds minute, many, narrow tailed at both ends, sometimes mistaken for *Spiræa Aruncus*, whose fruit has 3-4 beaks.

(*To be continued.*)

PROGRESS OF THE MAMMAL SURVEY.

When the last account was written in March 1912 (p. 640 of the last Journal) Mr. Crump was commencing to collect in Hoshangabad. From there he proceeded to Pachmarhi for a short spell and then to Saugor, Damoh, Balaghat and Chanda, all in the Central Provinces. He was unable to stay long in each district but managed to obtain some 519 specimens by the 12th July.

As the rains will probably set in by the latter part of June, it is proposed to bring Mr. Crump back then and a little later to send him to Sind where the rainfall is light and collecting of mammals will be practicable.

Mr. D. O. Witt, I.F.S., kindly rendered much valuable aid to Mr. Crump in the Saugor District and to Mr. Chevenix Trench, I.C.S., the thanks of the Society are also due to Mr. F. J. Langhorne, I.F.S., for the assistance rendered in the Damoh District and to Mr. C. G. Leftwich, I.C.S., in the Chanda District.

Mr. Shortridge has been steadily collecting in Kanara and has stayed at the following centres Samasgi, Sirsi, Hulekal, Jog, Gersoppa and Honawar from whence he has sent some 506 specimens up to June 4th.

He is now near Shimoga (Mysore territory) having completed Kanara and his proceeding towards Mysore and then to the Eastward and it is proposed as soon as the worst of the rains are over that he should proceed to Coorg, the Shevaroys, Nilgiris, Anamallays and Palneys where excellent results may be hoped for—but such a programme must, of course, take a very considerable time.

It will be noticed that the subscription list has made but little progress since the last list was published. The most satisfactory feature about it is the promised contribution from the Government of Madras who have kindly offered a grant of Rs. 2,500 towards the Survey. This grant is greatly appreciated and it is earnestly hoped that other Governments will follow this excellent example, particularly since the work which we are endeavouring to do is for the whole of India, Burma and Ceylon. It is also Imperial since we are giving specimens to the Imperial collection at the British Museum, South Kensington.

So far we have spent about Rs. 13,000 or roughly half the amount collected, and therefore if the work is to be completed a large amount of money has yet to be obtained.

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 31ST MAY 1912.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal No. 2, Vol. XXI	26,398	5	0
Andrews, G. P.	16	0	0
Bagshawe, L. V.	15	0	0
Blunt, H. R.	10	0	0
Bowen, J. C. G.	30	0	0
Burnett, Prof. K.	7	8	0
Cadell, P. R.	30	0	0
Coode, J. M.	15	0	0
Delme-Radcliffe, Lt.-Col. H.	15	0	0
Forsyth, Dr. Wm.	5	8	0
Gaye, W. C. (2nd Donation)	10	0	0
Gordon, R. G.	50	0	0
Gray, Chas.	25	0	0
Hannyngton, F.	15	2	0
Henderson, Dr. J. R.	25	0	0
Hyam, Judah	10	0	0
Jamkhandi, H. H. The Chief	100	0	0
Laurence, T. R.	15	0	0
Manners Smith, Lt.-Col. J.	15	0	0
Muspratt, Lt.-Col. F. C.	30	0	0
Royal Society, The .. .. .. £25 ..	372	12	0
Stables, Major A.	15	12	0
Suter, Dr. M. F. (Rs. 10 per month-March, April and May)	30	0	0
Total ..	27,255	15	0
Promised by the Government of Madras, Rs. 2,500.			

MISCELLANEOUS NOTES.

No. I.—NOTES ON TIGERS.

With reference to Mr. Pitman's note under the above heading (Vol. XXI, No. 2, page 657) I would draw attention to Capt. Forsyth's remarks in "the Highlands of Central India," pp. 267, *et seq.*, 1899 edition. He states that regular cattle-lifters are known to natives as *"oontia bagh"* from his faintly striped coat resembling the colour of a camel. The author's explanation is that cattle-lifters are usually larger, older, and heavier animals than game killers and have taken to a cattle diet owing to a decreasing activity with advancing age. He wrote : "The larger and older the animal, the more yellow his coat becomes and the fainter and further apart are the stripes."

COIMBATORE, 16*th May* 1912. C. E. C. FISCHER, I.F.S.

In the last issue of the Journal Mr. Pitman contributes two letters about tiger in the C. P. His experience of three cubs to the litter is unusual. I have shot and seen shot 8 or 10 tigresses, and I have not found more than two cubs carried. I have recently come across a tigress running with three cubs, one of which I shot. It was about three years old but the other two appeared to be a year old. As regards colouration in the hot weather Mr. Pitman's experience agrees with mine. The regular cattle killer is a fat beast, and his colour in the hot weather is very pale. The tiger who lives chiefly on game in the interior of forests is a much harder animal and keeps his colour even in the summer months. It is probably not a matter of protective colouring for the tiger in the daylight is always very conspicuous, his colour being obviously intended for the twilight. The darker colour of the tiger that does not live on cattle is probably due to his greater fitness.

BALAGHAT, C.P., 4*th May* 1912. F. DEWAR, I.C.S.

Mr. Pitman refers to the number of cubs in the tigress's litter in your issue of the 31st March last. I believe that four is not an unusual number to be found in the fœtus stage, but my experience goes to show that tigresses are seldom accompanied by more than two cubs, which points to the probability of not more than that number surviving.

As regards colouration of tigers, the differences noted by Mr. Pitman are probably due principally to age. At the same time animals inhabiting dense jungle are likely to be darker coloured than those of more open localities.

As tigers grow in age and weight, they are probably more addicted to cattle killing than game killing ; it is an easier occupation. Old tigers lose their brilliant colouring, and are sometimes quite faded, both as to the fulvous ground colouring and the stripes.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

CAMP, *23rd April* 1912.

[The Raja Saheb of Mudhol (Kolhapur) has lately presented to the Society the skins of 4 tiger cubs which he said were cut out of a tigress shot in N. Kanara this hot weather.—EDS.]

During the Viceroy's shoot at Moband (Siwaliks) last week a tigress 8 foot 9 inches was shot. Out of her were cut six fully formed cubs, 2 males and 4 females. Would you be so good as to inform me if you have ever heard of six being found before and if it is a rare occurrence?

V. A. S. KEIGHLEY, CAPT.,
Viceroy's Bodyguard.

DEHRA DUN, *30th April* 1912.

[We have not heard before of more than five cubs being found in a tiger's litter.—EDS.]

No. II.—NOTES ON PANTHERS.

Remarks regarding ten panthers whose skulls are presented to the Society, all recently shot in Buldana District, Berar.

Date on which Skull shot marked.	Sex.	Length of panther in straight line.		General Remarks.
		Head and body.	Tail.	
31-3-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Fully mature, as evident from teeth. Bright smooth coat; skull ridged; the rosettes about the centre of this animal's back have many central spots, as in the jaguar, a peculiarity I have not observed in others of the species, although there are occasionally two or three such spots.
6-4-12	Male.	3 ft. 6 in.	2 ft. 8 in.	Immature. Rough, fulvous coat. No occipital ridge.
10-4-12	Male.	4 ft. 3 in.	2 ft. 9 in.	Old; bright, smooth skining coat, skull ridged and elongated.
15-4-12	Female.	3 ft. 3 in.	2 ft. 5 in.	Immature, but living by itself. Rough coat. No occipital ridge.

16-4-12	Female.	3 ft. 7 in.	2 ft. 7 in.	Old and has had young. Bright smooth coat; ridged skull.
19-4-12	Female.	3 ft. 4 in.	2 ft. 6 in.	Young; has not borne young. Dull, rough coat. No occipital ridge.
21-4-12	Female.	3 ft. 6 in.	2 ft. 5 in.	Young, as evident from teeth. Thickly spotted, dark rough fur. No occipital ridge.
23-4-12	Male.	4 ft. 2 in.	2 ft. 6 in.	Old. Very smooth, bright, shining coat. Ridged skull.
25-4-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Mature. Appears to have had young. Pale colour, coat smooth. Ridged skull.
15-5-12	Male.	4 ft. 6 in.	2 ft. 9 in.	Very old. Dark colour, smooth coat. Ridged skull. This panther had a peculiar malformation of the tongue which was split in two for about four inches from the point.

Note.—In determining whether these animals were young, immature or old, I have not considered the presence or absence of occipital ridge, or the smoothness or otherwise of the fur. But have judged from the appearance of the teeth and sexual indications. It will be observed that in old animals there is invariably a strongly developed occipital ridge, an elongated appearance of the skull, and generally a bright, smooth coat. In young animals there is no occipital ridge, and the skull is rounder, while the coat is generally rough and has less pigmentation. Males are, of course, as in all the cats, much larger than females. These animals were all shot within a small area. They were all driven out singly, and were therefore sufficiently mature to be living alone. The old and the young respectively present those features which have sometimes led to their being divided into two species. They are undoubtedly all of one species, the features referred to being merely indications of age, such as one would naturally expect and not peculiar to this species.

In the Journal of 31st March, Captain Mosse reviews Mr. Hick's remarks on panthers and *pantherets* (!) in his book "Forty years among the wild beasts of India." I have already discussed this matter at length in another publication (*Pioneer*, October 1910). The experience of many years leads me to the conclusion, confirmed by recent observation, that the difference, between the two so-called species are generally, if not invariably, due to age. Size is no criterion; these, like other animals, vary in this respect, and it is impossible to draw a dividing line. As for measurements I doubt whether any female panther's head and body has measured as much as five feet in length, and I have never seen a panther with a tail as short as 2 feet; much depends, moreover, on the system of measurement, whether round the curves of the body, or in a straight line. Young panthers, like young tigers, have rough skins. I have never seen an old panther with no occipital ridge.

The statement as to the number of caudal vertebræ is to be found in Sterndale's Natural History, where that author quotes Temminck. It would be interesting to know whether Mr. Hicks derived his statement from that source, or whether it is the result of personal observation.

R. G. BURTON, Lieut.-Colonel,
Baroda, *May* 1912. 94th Russell's Infantry.

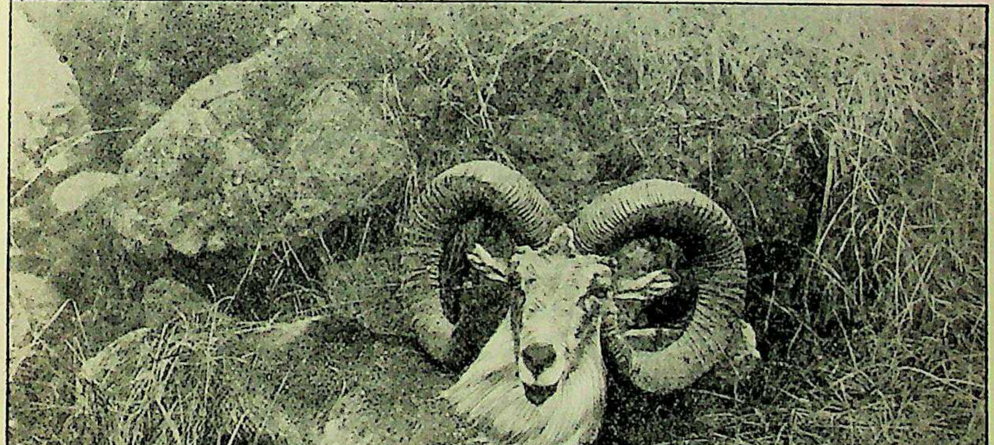
[Possibly Mr Hicks, if he sees this note, may be disposed to forward his panthers' skulls and skins to the Society for examination.—Eds.]

No. III.—A LARGE OORIAL HEAD.

The other day I had the good fortune to secure two very good Oorial heads and thought that perhaps a photograph of one of them might be of interest. They were both shot in the same hill, Khair Murat by name, within 25 miles of Rawalpindi. The smaller head measuring 30″ in length, and 10″ circumference at base of horn, is in some respects the handsomer owing to its wide spread and larger radius. The measurements of the larger head as certified to by some friends are :—

Length .. .. Right horn $36\frac{3}{8}$ in. Left horn $37\frac{1}{4}$ in.
Circumference .. Right horn $9\frac{1}{2}$ in. Left horn $9\frac{3}{4}$ in.

If the tips of both horns were not broken they would probably measure close on $38\frac{1}{2}$ in.



Can you tell me if this is the authenticated record for Cis-Indus? The Trans-Indus Wana record is, I believe, 40 in. obtained sometime during the last hot weather. I see the *Indian Field Shikar Book* mentions one of 38½ in. shot near Attock, but it does not seem to be authenticated.

This same book implies that the Oorial and the Shapoo are indentical. Is this correct? I have never shot Shapoo but have shot a considerable number of Oorial, and have seen a great many of their heads from Baluchistan, Wazristan and Cis-Indus. I have certainly seen some Shapoo heads in which the ends of the horns seemed to curve back slightly something like Burrhel horns, but I have never seen this in a single Corial head.

H. V. BIGGS, COLONEL.

RAWALPINDI, *6th January* 1912.

[The Oorial or Shapoo are practically the same, the Shapoo being the Ladak name for the Oorial. The Cis-Indus variety is *Ovis vignei cycloceros* and the record head, according to Rowland Ward's "Records of Big Game, (5th Edition)" is 39½ (length on front curve), 10¾ (circumference), Punjab (locality), Major F. H. Taylor (owner). We reproduce the photograph of Colonel Bigg's 37¼ Oorial.—EDS.]

No. IV.—THE SO-CALLED ONE-HORNED SHEEP OF NEPAL AND OTHER BREEDS.

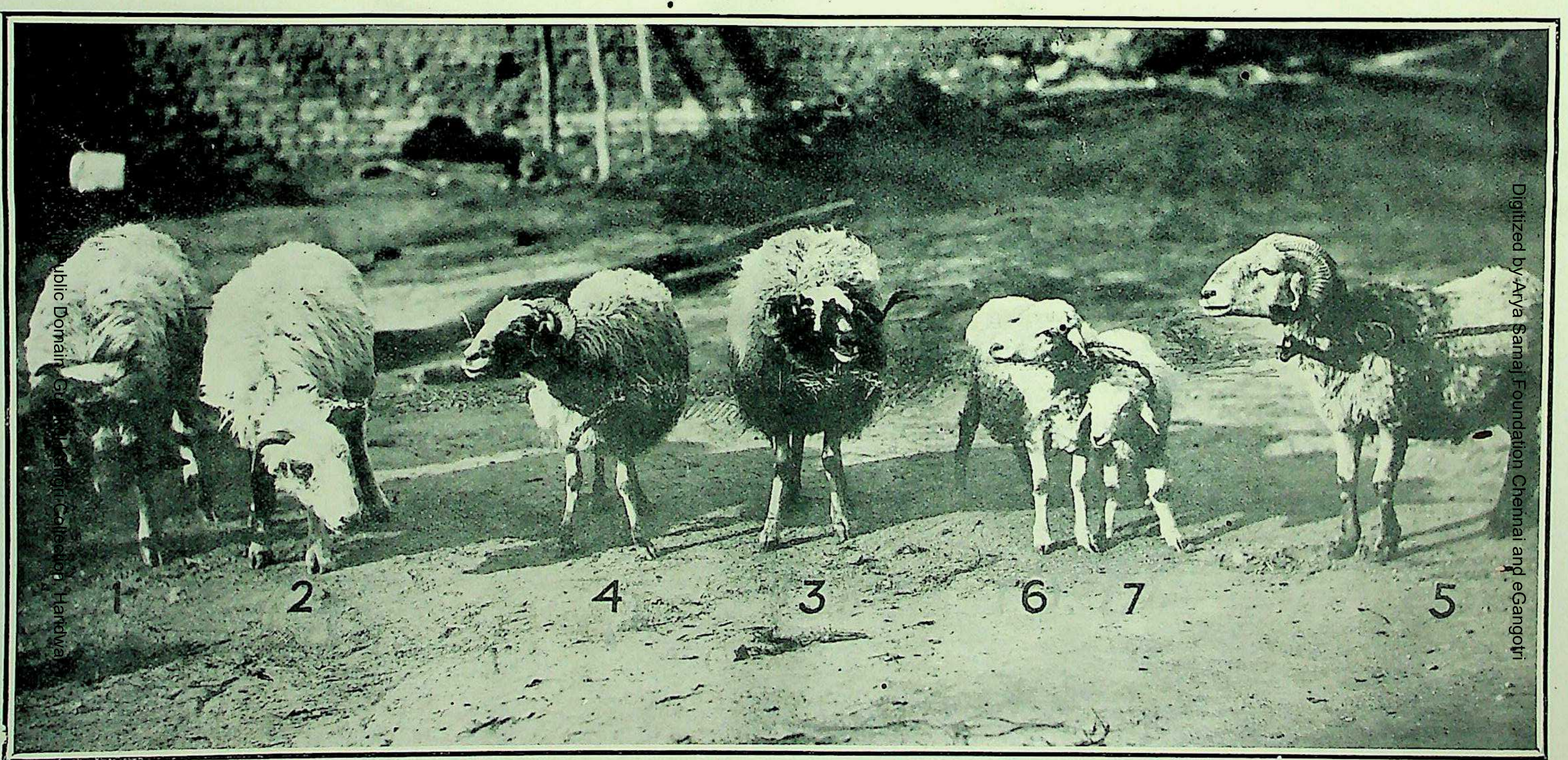
(*With a Plate.*)

I send a photograph of three of the typical breeds of Sheep in Nepal. The Prime Minister Maharaja Sir Chandra Shum Shere Jung has very kindly collected and presented me with a pair each of these three kinds of Sheep.

The Sheep in the photograph are as follows:—

(1) Barwal (ram).
(2) Do. (ewe).
(3) Hunia (ram).
(4) Do. (ewe).
(5) Kagi (ram).
(6) Do. (ewe).
(7) Do. (lamb).

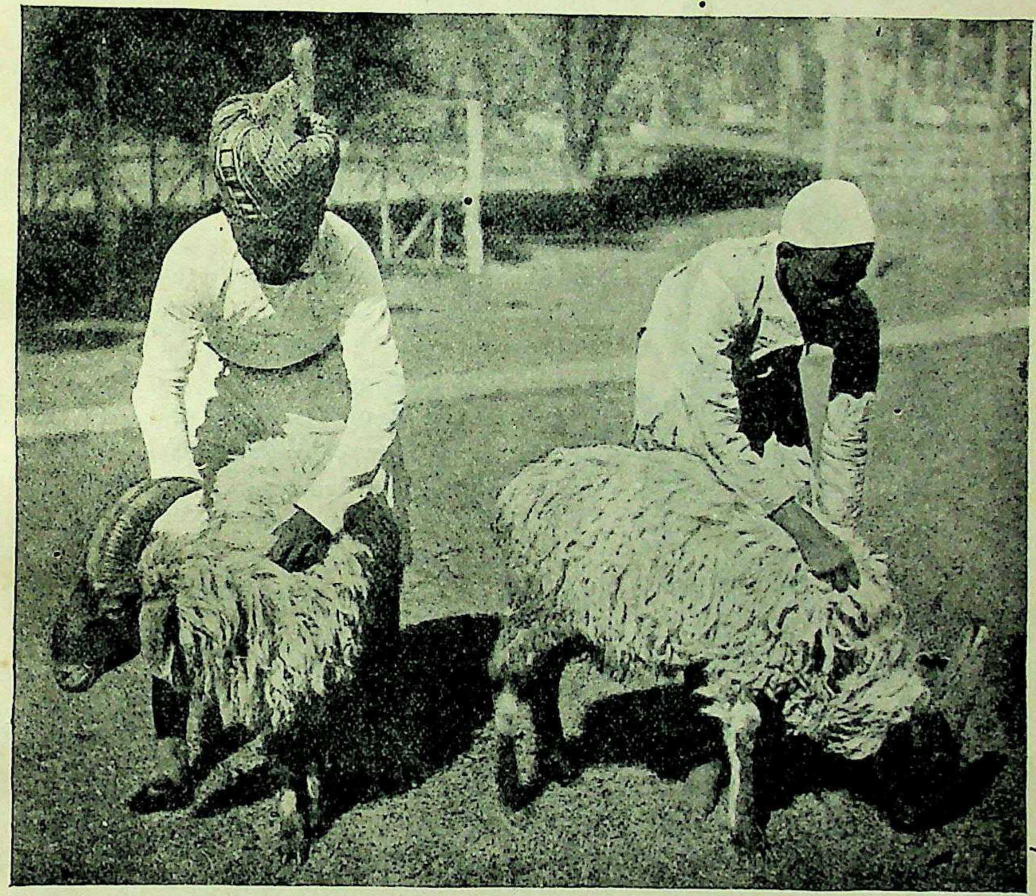
The rams of Barwal and Kagi make good fighting rams. The Hunia is sometimes used as a beast of burden. All three kinds are short-tailed sheep. There is another breed of Tibetan sheep which sometimes comes to Nepal, *viz.*, the Silling, which is the sheep mostly used to carry burdens. The Maharaja has not yet succeeded in obtaining a typical pair of these, but I believe they may be procured later.



TYPICAL BREEDS OF NEPAL SHEEP.

1. *Barwal* (*ram*).
2. *Do.* (*ewe*).
3. *Hunia* (*ram*).
4. *Do.* (*ewe*).
5. *Kagi* (*ram*).
6. *Do.* (*ewe*).
7. *Kagi* (*lamb*).

The small photograph is that of the so-called "unicorn" sheep. These sheep are "Barwals" and are really two horned sheep which have been converted into a one horned variety.

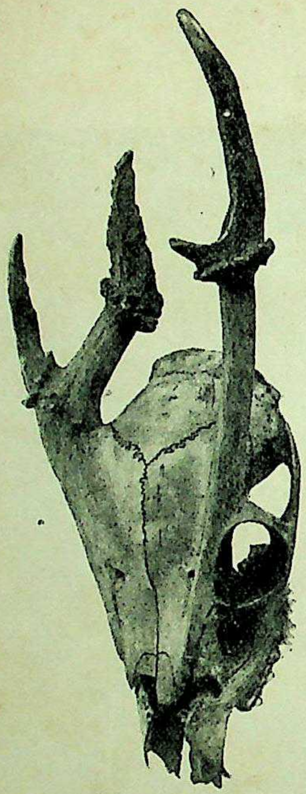


The Prime Minister has sent me the result of the enquiries instituted by him. The report is that to make the unicorns, the lambs when about 2 or 3 months old are branded with red-hot irons where the horns are sprouting. This prevents the horns from growing in the usual places and induces them to come out joined together from the top of the skull.

J. MANNERS-SMITH,
Lieut.-Colonel.

THE RESIDENCY,
NEPAL, 27*th March* 1912.

No. V.—SOME NOTES FROM THE ABOR EXPEDITION.



I send a Kakur (*Cervulus aureus*) head showing three distinct horns, or, if a small stud is counted, which is quite separate, it has four horns.

I found it in this village and thought it would be a nice addition to our museum.

I have discovered that the Takin (*Budorcas taxicolor*) extends into the Dihong Valley, for an Abor has a head here, which was taken off an animal which was washed down the river two rains ago. It must have come from some distance further up, as no one here had ever seen one before.

The *red* serow is quite common. I have got an 11½ inch head.

I have not found the true Mahseer (*Barbus tor*) as high as this though 20 miles lower down they are common.

Here I have only caught the "boka" or "kalabano" and got one of 20 lbs. amongst a dozen or so over 15 lbs.

ALBAN WILSON, MAJOR,
8th Gurkhas.

GEKU, ABOR FIELD FORCE,
ASSAM, 12*th February* 1912.

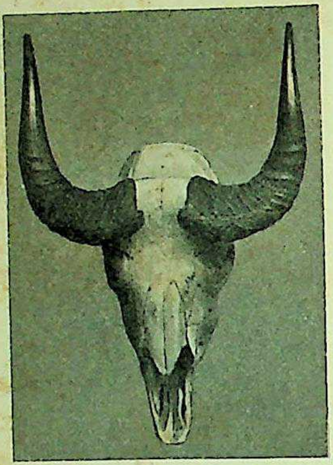
No. VI.—DO CHINKARA (*GAZELLA BENNETTI*) DRINK WATER?

Your correspondent, Mr. Pitman, refers to this question in the Journal of 31st March last. He will find that I fully discussed the matter in an article on "The drinking habits of wild animals" in 1908, in the Journal Vol. XVIII, p. 250?

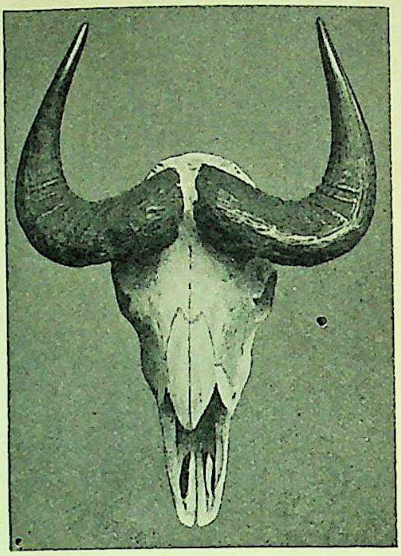
The error as to these animals being "said never to drink" appears to have originated with the late Dr. Blanford, who has been followed by other writers. I have recently had my previous observations confirmed by seeing large numbers of this gazelle trooping down to drink in the middle of the day during a particularly dry season.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

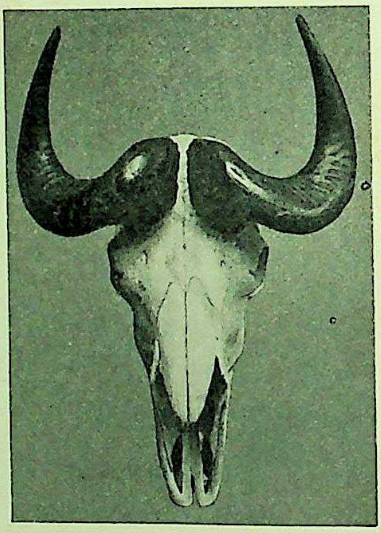
CAMP, *April 23rd*, 1912.



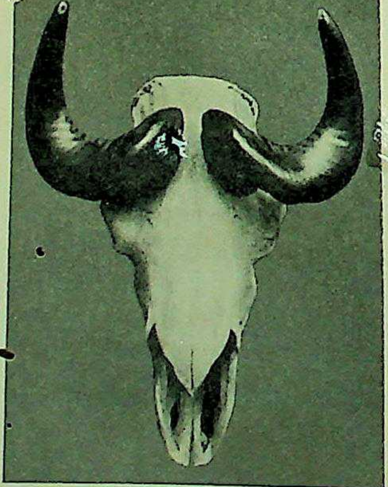
1.—Young Male, horns 14¼″



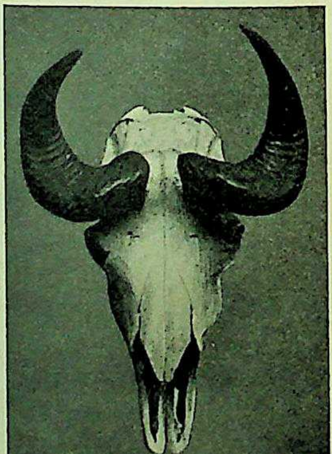
2.—Male, horns 18¼″ and 18½″



3.—Adult Male, horns 20¼″



4.—Old Male, horns 17½″



5.—Female, horns 15″

HEADS OF TAKIN, *Budorcas taxicolor* (front view), FROM THE MISHMI COUNTRY.

Mr. Pitman's experience of Chinkara drinking is very interesting. In his recent book Mr. Stebbing notes that the Chinkara is a desert animal and the more dry and sandy a place the better it suits him. Personally though I have often seen deer drinking, I have never seen an antelope do so, neither a Bluebull, a Black buck, a Fourhorn nor a Chinkara. They are keen on perennial streams and their neighbourhood, but chiefly for the sake of fresh young grass. In my experience antelopes are much harder than deer, and I have attributed this partly to the fact that they seldom drink water. I should be glad to hear whether anyone else has seen an antelope drink?

F. DEWAR, I.C.S.

BALAGHAT, C. P., *4th May* 1912.

No. VII.—RECOVERY OF ANIMALS FROM INJURIES.

In some of your recent issues I have seen notes of some remarkable recoveries from injuries in beasts and birds. The other day two such cases came to my notice. The first was a Sambhur stag, full grown, which was going perfectly well and sound when I shot him. On examination I saw a large hard thickening in the bone of the off hind leg below the hock. I skinned the part carefully and found that the bone had been fractured and set again without any shortening. From its appearance it must have been when the animal was quite young.

The second case was a solitary boar which I shot. He was a big beast 35½″ at the shoulder with good tusks. There was a healed scar on his right shoulder and a soft lump which turned out to be an abscess full of fœtid matter. Thinking it an old bullet wound I examined further and found the point of a boar's tusk about 2½″ long firmly embedded in the bone of the shoulder blade where it had snapped off short. The external wound had healed up completely and the animal showed no signs of lameness.

W. J. H. BALLANTINE,
ASSISTANT POLITICAL OFFICER.

SADIYA, UPPER ASSAM,
5th January 1912.

No. VIII.—NOTE ON TAKIN (*BUDORCAS TAXICOLOR*).

With 2 Plates.

In July of last year when just north of the Mishmi Hills at an altitude of about 10,000 feet, I was fortunate in finding a place frequented by a herd of Takin. This herd about 300 in number spent each night in the vicinity of a hot spring drinking the water and browsing on the trees around it. I had a good opportunity of watching them for several days at a distance of about 80 yards as they emerged from the rhododendron and willow jungle to drink the hot water.

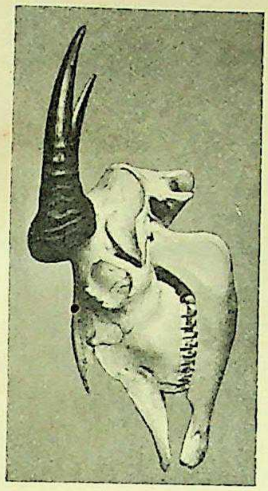
The first thing that strikes one on seeing the herd of animals is, the great variety of colour, ranging from very dark grey to a golden yellow: the animals are all conspicuously lighter on the withers and have a darker dorsal stripe. The very young ones are quite dark, the dorsal stripe being inconspicuous; the females are also dark having no trace of the yellow which is seen on the males. Adult males are light yellow over the withers and back and darker in other parts, while the very old and large males are a darker yellow.

The horns of the young grow straight up from the head with an outward tendency; later they grow outwards and upwards (see fig. 1); in the final stage the horns grow forwards, bend downwards and outwards, with the points growing up (see figs. 2 & 3). The horns are very deceptive as regards length, and even at a short range with a telescope it is difficult to pick a good head. The points of the horns of a young male which have not yet curled may be higher above the occiput than those of an older animal, a fact which makes it difficult to distinguish a large pair of horns. In shooting the animals I found it best to disregard the horns and to shoot the animals of largest size. The old males are quite easy to recognise being very much more bulky than the others and being darker in colour than the younger males.

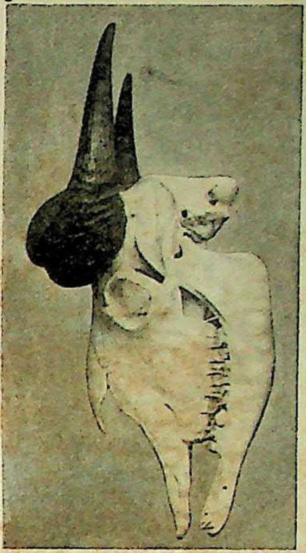
In the figure which accompanies Mr. Pocock's paper in Vol. XIX of the Journal the neck appears to be too long and not nearly thick enough. The horns are longitudinally wrinkled and irregularly transversely ringed at the base but old horns (see fig. 4) are much smoother and the points being worn down, they are also shorter.

Takin are possessed of a very keen sense of smell but their alarm even when fired at, quickly subsides and they returned to the hot spring a few minutes after being driven away. Only on one occasion did I hear a sound uttered by these animals; this was a snort of alarm given by a female who walked up to where I was standing and did not see me until she was within six or eight feet; on hearing this the herd galloped off. On other occasions when alarmed, they were off without making any sound.

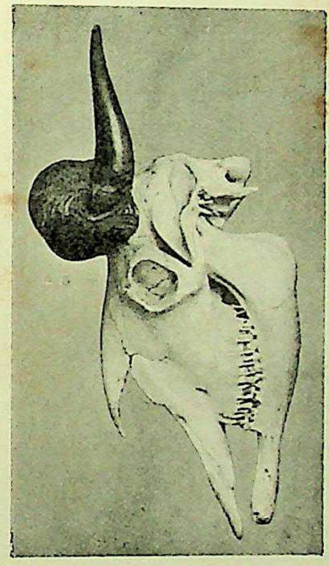
In the day time this herd remained in the dense rhododendron forest, but at 3 or 4 o'clock in the afternoon they would come down to the hot spring and stand in the water in a dense crowd sometimes pushing and bustling each other in their eagerness to drink the water. It is probable that they remained here all night, as before daylight they were still in and near the spring and could be seen browsing on the willows trees near the water. I was told that in winter no Takin are found at the hot



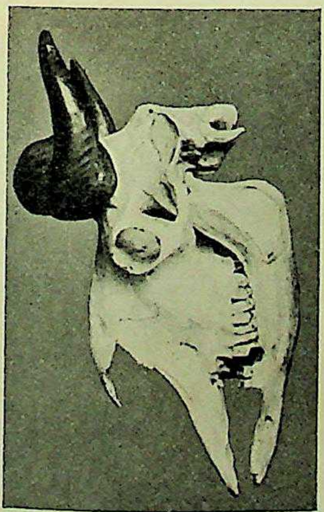
1.—Young Male, horns 14¼"



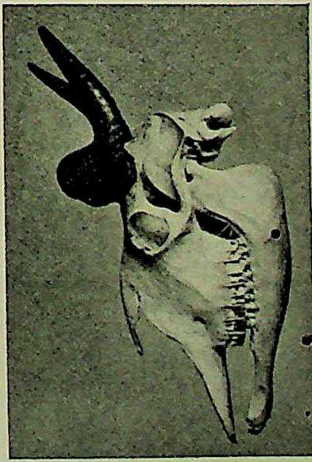
2.—Male, horns 18¼" and 18½"



3.—Adult Male, horns 20¼"



4.—Old Male, horns 17⅛"



5.—Female, horns 15"

Heads of Takin, *Budorcas taxicolor* (side view), from the Mishmi Country.

spring, but that this large herd breaks up into parties of 10 or 20 when it is with difficulty that the native hunters can find and shoot them. They are large heavy animals and should be shot with a heavy rifle.

The ground on which I saw these animals as well as that on which I saw tracks near Ta Chien Lu in Ssuchuan was steep, but it cannot have been nearly so steep as that which the late Mr. Brook describes.

I collected a good set of skins of different ages and sexes but unfortunately none of these survived the continual rain which fell when they were shot and while they were being carried back to India.

The Chinese name for Takin is "Ye-Niu" meaning "wild cattle." Near Tachien Lu the Tibetans call them "Ya-Go," but near Rima the Tibetan name is "Shing-Na." To the Miju Mishmis (*i.e.*, those living near Rima) they are known as "Kyem," while the Mishmis up the Dibang river (Chulik Atta tribe) call them "Akrön." The Abor name is "Siben-ö". Takin is the name used by the Digaru Mishmis who inhabit the country where the Lohit river approaches the plains.

The following are some measurements of those obtained :—

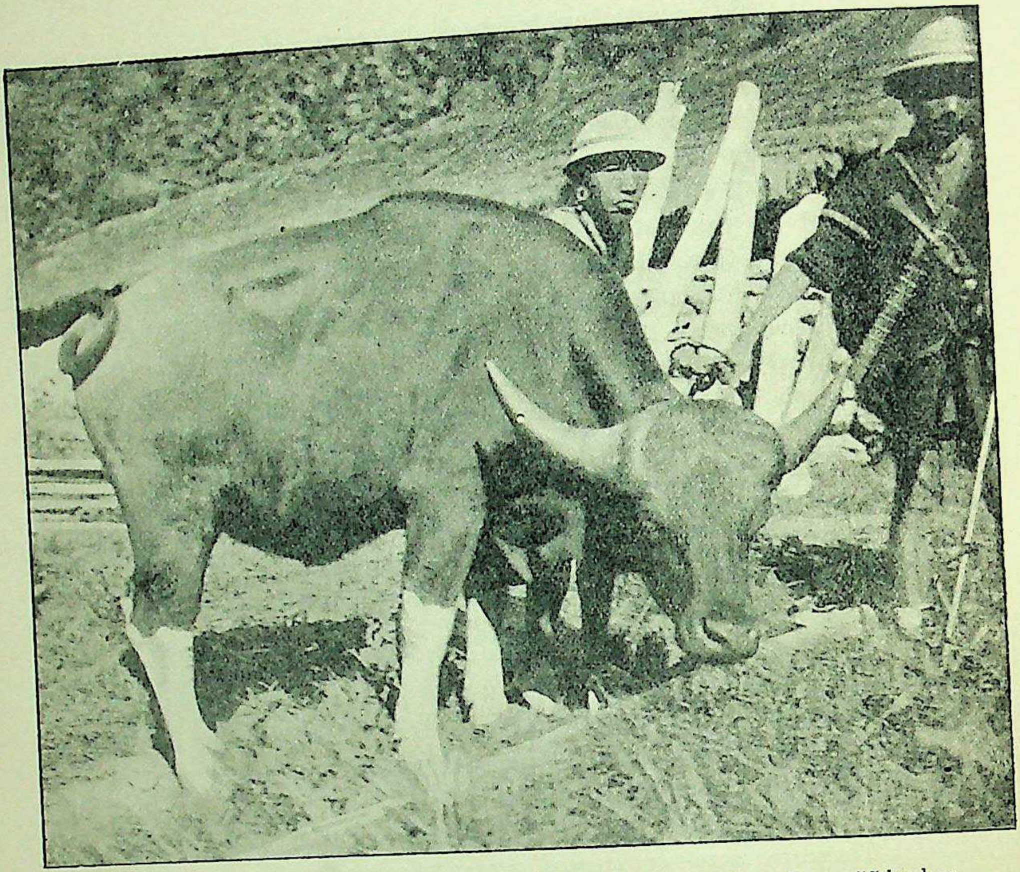
	Sex.	Head & Body.	Tail.	Ear.	Height.	Horns.
Number 1. (figs. 1, Pl. A. & B.)	Male	5′ 9″	4″	4″	3′ 3″	14¼″
„ 2. (figs. 2, Pl. A. & B.)	Male	..	..	..	..	18¼″ 18½″
The above two animals had very yellow coats.						
Number 3. (figs. 3, Pl. A. & B.)	Male	6′ 4″	..	..	..	20¼″
„ 4. (figs. 4, Pl. A. & B.)	Male	6′ 4″	4″	4″	4′ 5½″	17⅛″
These two were very large in size and darker than Nos. 1 and 2.						
Number 5. (figs. 5, Pl. A. & B.)	Female	5′ 6″		..	..	15″
„ 6.	Female	5′ 7½″		..	..	14¼″

F. M. BAILEY, Capt.

Aligarh, U. P., *March* 1912.

No. IX.—GAYAL OR MITHAN (*BIBOS FRONTALIS*).

The photo here reproduced is that of a tame Mithan and was taken in a Mishmi village. The Mishmis and Abors keep a few of these cattle. They are not milked. Specimens are as a rule similarly coloured though I have seen one with a white head. There are no wild Mithan in the Mishmi or Abor hills. I was once shown a skull which the Mishmis said was that of a wild Mithan; the horns of this specimen were longer and more curved than those of the tame cattle and the skull was evidently that of a Gaur. This had been killed by a native hunter in the plains at the foot of the Mishmi hills. The skin and skull of the animal in the photograph have been given to the Society.



The animal measured 85 inches from nose to base of tail and was 55 inches high. The horns are 16 inches in length, 14½ inches in circumference and 30½ inches between the tips.

F. M. BAILEY, CAPT.

ALIGARH, *March* 1912.

No. X.—TSINE (*BIBOS SONDAICUS*) FOUND WITH VILLAGE CATTLE.

The following may be of interest:—Last dry weather at the village of Kyaung-lé in the Kathir district of Upper Burma, a bull Tsine (*Bibos sondaicus*) came down alone and associated with the village cattle which were grazing in the reaped paddy fields adjoining the village. He remained there for all the dry weather apparently doing nothing beyond herding the cattle, as if by chance any of them showed signs of straying away he rounded them up and then settled down again exactly as a sheep dog would do. He apparently became quite domesticated paying no attention to the villagers looking after their cattle; in fact, Mr. Adamson, the Sub-Divisional Officer, Banmauk, was able to take a photograph of him at about

40 yards. So far the villagers assert he made no attempt to have connection with the village cows and at the end of the hot weather he retired into the jungle and was not seen again till last December when he reappeared among the cattle and resumed his former habits. About a fortnight ago, however, he was noticed to be paying particular attention to a young cow that had not yet been crossed, and after a few days he disappeared with her into the jungle and neither of them has been seen since. It remains to be seen whether either will return but they probably will and the result if any will be very interesting. I am glad to say strict orders have been issued that the Tsine is not to be shot or interfered with in any way. It is not an old bull and it is strange why it should have taken to this solitary life. Can it be that it has been driven out of the herds by an older and stronger bull and so forced to come to the village cattle for companionship? Considering the usual timidity and wariness of Tsine it seems extraordinary.

T. A. HAUXWELL,
Conservator of Forests, Burma.

BANMAUK, *26th February* 1912.

No. XI.—NOTES ON BIRDS FROM LAHORE.

On April 30th, 1911, I saw a pair of Sparrows building in a Baya's (*Ploceus baya*) old nest in a Keekur tree. Thinking it unusual I put my glasses on them and found they were a pair of Rufous-backed Sparrows (*Passer pyrrhonotus*). On May 12th I looked them up again. Seeing both birds in the tree I climbed up and found they had four eggs of the finely freckled type. Incubation was advanced. I shot both birds to put the matter beyond doubt.

Again on August 6th, 1911, I saw a pair of this Sparrow building in another Baya's nest. On revisiting this locality I was sorry to see the egg chamber had been torn open from the exterior and no Sparrows to be seen. The curious part of this was that all the remaining Baya's nests had been treated in the same way! What could have done it? I thought the foregoing might interest some of the readers of the Journal as I see no mention of a similar occurrence in "Nests and Eggs" nor the "Fauna of British India" Birds. In May and June I saw many nests of the Golden Oriole (*Oriolus kundoo*) and with but few exceptions there was a nest of the Black Drongo (*Dicrurus ater*) in the same tree, in some cases on the same branch. Is this instinct or reason? Surely the Orioles know the great protection they obtain from the presence of the King Crows. On October 27th while taking a stroll near the Ravi, I heard a familiar note and on going up to the sound was pleased to see a Grey-headed Flycatcher

(*C. ceylonensis*) a bird I know well in the hills around Simla. In the "Fauna of British India" it is stated :—*Culicicapa ceylonensis.* Distribution. "The whole Empire, except Sind, the Punjab and Rajputana, from which provinces I have not seen any specimens."

A. E. JONES.

Lahore, 14*th December* 1911.

[Major Magrath found this Flycatcher a fairly common winter visitor at Bannu and obtained one specimen as early as October.—J., B. N. H. S., Vol. XX, p. 777.—Eds.]

No. XII.—NESTLING PLUMAGE OF THE GREAT STONE PLOVER (*ESACUS RECURVIROSTRIS.*)

As I can find no record of the down stage of *Esacus recurvirostris* the following description may be worth noting. On the evening of April 14th, 1910, I found a clutch of two eggs of this species in the bed of the River Sutlej at Phillour, which were chipped. These I took, and with my aid both young birds hatched the following morning. They were described on the 16th as follows :—

Upper parts ashy grey, tinged with sandy, much of the down with black tips. A black line divides the forehead and crown extending to the anterior corners of the eyes, and curving downwards over the cheeks to the ear coverts, nearly meeting black lines, which start from the posterior corners of the eyes and almost join on the occiput. The eye lids are fringed with grey down, the lower bearing a single black spot. An indistinct and broken black line crosses the upper back and extends along the upper portion of the flanks to the tail. There are indistinct black spots on the back. Wing ashy grey but without the black tips to the down, the anterior edge of the forearm darker, a black spot at the inner angle of the elbow. Lower parts greyish white.

Bill, short and stout, culmen curved ; dusky black, naval pits lighter. Eggtooth whitish. It is lightish brown. Feet plumbeous grey.

Call, a shrill chirrup, rather similar to that of a young sparrow.

H. WHISTLER, Indian Police.

Rawal Pindi, *April* 1912.

No. XIII.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES,* Vigors.)

With reference to the discussion on this species started in the Journal [Vol. XX, p. 517] by Mr. Dodsworth, the following facts may be worth bringing to your notice. Col. Rattray in his article on "Birds nesting in the Murree Hills" in Vol. XVI of the Journal, p. 658, states :—"These birds arrive suddenly at Murree about the middle of June and at once set about building, 3rd July was the earliest date on which I got eggs." Last year (1911) I had to spend a couple of days in May at the Police Rest House of Kotli, which is situated at about 5,400 feet in the hills south-east of Murree, overlooking the River Jhelum. While I was there I frequently noticed a flock of these birds in the neighbourhood of the bungalow and shot a couple [Skin Register Nos. 373 & 374, Kotli, 26th May 1911], which proved to be young birds that had only recently left the nest. The flock contained 15—20 birds.

These facts tend to show that after breeding early at a low elevation, the birds migrate for a second brood at higher levels, a theory that should easily be disposed off one way or the other.

H. WHISTLER,
INDIAN POLICE.

RAWAL PINDI, *April* 1912.

No. XIV.—DISTRIBUTION, HABITS, AND NESTING OF THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*, Vigors.)

A few years ago, when I first began to take an interest in this pretty little Greenfinch, I noticed that in the neighbourhood of Simla and adjacent ranges, it became tolerably common from about June (earliest date on which seen here up to this 4th June), to the end of October, and then seemed to disappear. Thinking that it was probably subject to a seasonal movement along these ranges, like some other hill birds, I consulted various books and papers on Ornithology, to which I had access, but found no mention of this, and yet I was certain that this species was not a permanent resident here.

In order, therefore, to clear up all doubts I made an enquiry (J. B. N. H. S. Vol. XX, p. 517) as to whether this bird was a permanent resident at moderate elevations. In addition to the replies received to this, and which are recorded in the Journal (*vide* Vol. XX, pp. 852 and 1152, and Vol. XXI, p. 262), I received the following from Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

"The bird breeds at Darjeeling at elevations between 8,000 and 10,000 feet, and perhaps as low as 7,000 feet. Like most hill-birds, it moves up and down with the varying seasons, higher in the hot weather, and lower as it gets colder. I do not think one could call them migratory."

In view of the observations referred to above, I think there can no longer be any doubt as to this species being subject to a seasonal movement along these ranges, and it would, therefore, be more correct to give its distribution as follows: Common from about May or June to October along the

Himalayas at elevations of 6,000—10,000 feet, and, perhaps, even higher, from the south side of the Pir Panjal Pass in Kashmir (Brooks) to Sikkim (Blanford): also recorded from Manipur (Godwin-Austen). During the cold weather these birds move down to lower elevations, and the North-West Himalayan ones, at all events, are found in the Duns and plains (Bijnor to Pilibhit) at the foot of the mountains (Osmaston).

These Finches generally keep to the woody portions of the hills, and are gregarious, moving about in small flocks, except during the breeding season, when they pair off. They appear to be partial to certain localities in the station here, and are not to be seen in other parts of it at all. When once established at a particular spot, after their first arrival here, they frequent it with great regularity. The abundance of food supplies is doubtless the most important factor that influences selection, as they only come up here to breed: but it seems also essential for them that the hill-sides shall be fairly well wooded—those covered with Himalayan Cedars (*C. deodara*), and Blue Pines (*P. excelsa*), undoubtedly receiving the preference.

They are very fond of the ripe seeds of the sun-flower plant, and during their sojourn in Simla, these seem to constitute their chief diet. In order to secure these seeds, they visit the gardens and compounds here freely. When feeding, which is generally in the early mornings and afternoons, they are not at all shy, and allow one to approach quite close to them. The cocks, I have noticed, are gorgers; one will take up his position on a particular flower, have a few nips, then take a "breather," and start afresh. If by chance another cock happens to settle on the same flower, a battle usually ensues—both birds fighting in the air, and then quietly flying off in different directions. No twittering, as a rule of any kind, goes on among the birds while feeding, and their yellow and green plumage blends beautifully with the flowers; in fact to such an extent that at times it is difficult to catch sight of them even at close quarters.

Their flight is undulating and swift, and when passing across or overhead, it is not at all easy to catch sight of them, but their peculiar twittering, which is constantly uttered, betrays their movements.

There is some disagreement among ornithologists in regard to the notes of this bird. Adams states that its cry is very like that of the English Siskin, but Hume contradicts this and so does Brooks. The latter's description of its song is undoubtedly the best: he aptly likens it to the characteristic "beez" of a Greenfinch. This "beez," I may add, is only uttered by the cock, usually when perched on the topmost branch of a tree, and can be heard from a long distance off. The other note, which is also indulged in by the hen, is a soft twitter or "chick" constantly emitted, even when on the wing.

This Finch breeds in July and August, but the great majority of the birds lay in the last mentioned month. The earliest and latest dates on which I have taken eggs are the 31st July (3 fresh eggs), and the 14th September (3 fresh eggs), respectively. I may, however, mention that on the 26th July of this year I found a nest containing four young ones, about a week old, and the eggs in this case must have been laid about the end of the first week of that month.

The highest altitude at which I have found these birds nesting is 7,000 feet, but by far the largest number breed at about 6,000 feet: I have never yet taken a nest below the latter elevation.

These Finches are gregarious in the strict sense, even to the extent of breeding in company, and it is curious that this point should have escaped the observations of Hume. I remember once finding no less than half a dozen nests within a radius of not more than 15 yards, and on another occasion, four nests within a radius of about 15 yards. I have several times found two nests quite close to each other, and once I took a couple of nests from the same tree. It is true that I have sometimes found isolated nests, but I consider this the exception, or, perhaps, what is more probable is that there were other nests close by which were not located. In connection with the gregarious habits of this bird, I extract the following *in extenso* from my daily Journal :—

21st August.—Took another nest containing five fresh eggs placed on a *P. excelsa*, about 25 feet distant from the tree, which contained the second nest mentioned above. In the latter case only two eggs were taken, but the clutch was probably not complete. My idea is that the bird to which these two eggs belonged, on finding her nest gone, forthwith went and deposited her remaining egg or eggs in to-day's nest. It is not unusual to find five eggs in a nest, but the above is corroborated to some extent by (*a*) our seeing *three* birds—two hens and a cock—hovering about in the vicinity, and judging from their anxious behaviour when the climber approached the nest, there seemed little doubt that it was a sort of "joint stock" concern, which belonged to them all, and (*b*) the fact that this nest a few days previously only contained three eggs: day before yesterday it still contained only three; to-day we were astonished at finding five!

I have never yet had the good fortune to witness the courtship of these birds, though I have frequently seen them *in copula*, after the manner of sparrows, near their nests. They pair off soon after their arrival here, and are shortly afterwards busily engrossed in domestic affairs.

They have only one brood annually, so far as Simla is concerned, and build a fresh nest each year: I have never known them ever to take possession of the nests of other birds, though on one occasion, I noticed a hen lining her nest with horse-hair taken from an old nest belonging to a Jungle Crow (*Corvus macrorhynchus*), which was close by.

I have already stated that these birds generally resort to hill-sides covered with Himalayan Cedars and Blue Pines, and these trees are *par* *excellence* the ones which are chosen for nesting: I have never yet found a nest on an oak, though Hume records having done so. According to him the Deodâr, by which he apparently meant the Himalayan Cedar, *Cedrus deodara*, is the favourite. Out of a total number of 29 nests, which have come under observation during the last few years, I find that the results in regard to the selection of trees by these birds are as follows:—

Himalayan Cedars (*Cedrus deodara*)	16 nests.
Blue Pines (*Pinus excelsa*)	11 ,,
Kharki trees (*Celtis australis?*)	2 ,,

When a Himalayan Cedar has been chosen, the nest is invariably placed on the upper surface of one of the horizontal branches, generally towards the extremity; and in the case of a Blue Pine, in one of the uppermost forks or tufts. In the "Kharki" trees, the two nests were built on the outer ends of the branches, where they had been pollarded for the village cattle. They were all firmly attached to the boughs or twigs (in whichever of their positions they happened to be placed). *The* feature about these nests, however, is that no matter what their position may be, or on what trees they are placed, they are all without exception *well* hidden: in fact so admirably is concealment effected that, if not discovered during the process of construction, it would be almost impossible to find them afterwards. Every advantage is taken by the birds of a thick tuft, or bunch, or cluster of leaves under which to build their nests, and I am firmly convinced that these elaborate precautions are taken, not only as a safeguard against possible enemies, but also as a *protection against the heavy showers of rain*, which we usually have in these parts in August, and this is the month during which most of these birds lay. I have frequently made a point of examining the tenanted nests after very heavy showers of rain, and have always found them to be absolutely dry—a marked contrast to some of the nests of *T. lineatum*, which are still to be found at this time, and which are usually wet and damp. Another point worth mentioning is that a large number of finished nests are deserted, and this, I think, is due to their not being found sufficiently water-tight on completion. What adds colour to my supposition is that, on examining these deserted nests, I have always found them to be soaked with water. As illustrating how well these nests are concealed, I give below the substance of a note from my daily Journal.

About the beginning of the second week of August, one of my hunters found a nest of this bird being built. He visited the tree two or three times, and after allowing sufficient time for the full complement of eggs to be laid, I accompanied him to the spot early in the morning to take them, but on examining the branch the man reported that the nest and eggs had disappeared! I could hardly credit this, as the nest had been inspected only the evening before and it then contained three eggs. Before leaving the spot, I told the man, as a last hope, to break the leaves from the branch, near the spot where the nest had been, and to make a further careful search, and on his doing so, he found the nest and eggs. And yet the whole time, he had been standing on the branch not more than half a dozen inches away from the nest!

The nest takes about a week or nine days to complete, and the hen alone, in addition to carrying the materials, is the sole architect. The cock follows her about but gives her no help whatever. The time when the hen is most active in carrying materials, while building is progressing, is from early in the morning to about 10 or 11 A. M., and this is *the* time to locate a nest. Between 11 A. M. and 3 P. M. occasional trips are made to the nest, and then only after long intervals. After 3 P. M. building operations cease for the day. A great deal of twittering goes on while the hen is in the nest, and when the latter is nearing completion, the birds are frequently to be seen pairing near it.

The nests are compact, neat, cup-shaped structures, composed chiefly of stalks and roots of grass and small plants, and other such like materials (one only of my nests has a thin coating of moss—Hume says that there is *much* moss blended with the exterior), and lined interiorly with very fine grass-roots, thin fibres resembling coir, horse-hairs, and a few feathers, and occasionally bits of cotton. The dimensions of 12 nests agree generally with those given by Hume.

The heights of the nests varied from 6 to 65 feet, but the average height of 29 nests was 30 feet.

In some cases I noticed that the birds commenced laying immediately the nests were completed; while in others, a short period elapsed.

The number of eggs varied from 3 to 5, but the normal complement is 4. The largest number of young ones found in a nest was 4, and the smallest number of well incubated eggs was also 4.

The eggs are laid one daily, and the hen usually begins to brood after the second egg has been laid.

The hen alone performs the labours of incubation, and while sitting in the nest is fed by the cock. The young are hatched in 13 days, and both birds help in feeding them. They leave the nest in about a fortnight, and follow their parents about for some time, and are fed by them.

The eggs of this bird are excessively delicate looking and pretty. The colouration of both unblown and blown eggs is generally as described by Hume, but there are some slight differences, which become apparent, in a large series. I have before me at present 46 specimens, which exhibit the following variations as compared with Hume's account.

"The eggs when fresh are a delicate, slightly *greenish*-white," usually with an irregular ring, and occasionally with an irregular *cap* of minute blackish-brown spots round the large end, and the *majority* have a few similar specks scattered here and there over the body. In addition to the blackish-brown spots forming the irregular rings or caps, some specimens have specks of various shades of reddish-purple.

After a very short time the blown specimens unfortunately change colour, and the ground colour becomes "a very delicate pale sea-green," but the blackish-brown and reddish-purple specks remain unchanged.

With reference to fresh eggs, I take this opportunity of mentioning that when blowing the specimens, great care should be exercised, as the spots are liable to run.

The general shape of the eggs is an oval, a good deal pointed towards the small end; but a few (and these are rare) are somewhat elongated, with blunt ends. One or two of my specimens, apparently deformities, are almost eliptical in shape.

In size they varied from ·67″ to ·68″ in length, and from ·52″ to ·58″ in breadth; but the average of 46 specimens measured was ·73″ × ·55″. The average weight of 25 fresh eggs was 29·94 grains.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 12*th June* 1912.

No. XV.—THE LONG-TAILED GRASS WARBLER (*LATICILLA BURNESI*, Blyth.)

The distribution of this species is given in the Fauna [Vol. II, p. 380,] as "Upper Sind from the junction of the Chenab and Indus rivers to Larkhana, and also on the Eastern Nara, where Doig found this species breeding. Jerdon records it from Monghyr on the Ganges in March."

Hence I was somewhat surprised to find that this curious little bird is a very common resident in the grass jungles that border the River Sutlej on its passage through Ferozepore District.

They are to be met with both in pairs and in small parties and habitually frequent the lower portions of tufts of grass which they tread in a mouse-like manner, but before entering the tuft they usually perch on an outer stem for a few seconds, which renders the task of securing specimens fairly easy. The song is short but quite sweet, and in addition they have several scolding notes with which to greet the intruders.

I failed to secure eggs, but on April 8th found a nest containing 3 half-fledged young. This nest was large for the size of the bird, cup-shaped, and placed low in a grass tangle, growing round some dwarf tamarisk. It was made of grass and grass down, the latter being welded into a somewhat felt-like lining. Two similar nests were found and attributed to this species, but they had obviously been used and left. The nests are very difficult to find.

On occasion these little warblers can be confiding enough. One evening I was lying in a thick patch of jungle at the edge of the river watching a gaggle of barheaded geese when one *Laticilla* came and ate something on the ground within a yard of my face.

H. WHISTLER,
Indian Police.

Rawal Pindi, *April* 1912.

No. XVI.—NIDIFICATION OF BURMESE GREAT BLACK WOODPECKER (*THRIPONAX FEDDENI.*)

To-day (February 6th) I have obtained the eggs of this species from a tree close to my present camp, about 15 miles east of Thayetmyo.

Yesterday one of my elephant attendants reported to me he had found the nest-hole, and that the bird, a black and white woodpecker, had flown out and that he had felt the eggs. I was rather doubtful as to the truth of his statement, but the same afternoon proceeded with him to inspect. He took me to a "Letphan" tree standing in an old clearing, all around being "Kanig" grass interspersed with a few tall trees. Locality close to banks of a broad creek. I saw the nest-hole at once, and as we were talking the bird flew out, an undoubted specimen of the Burmese Great Black Woodpecker. I did not shoot it, although it offered many opportunities, as it kept flying from tree to tree close at hand, uttering its raucous call, because I was not yet certain whether the hole contained eggs.

The Letphan tree in which the hole was made, was about 2 feet in circumference, the hole was situated about 14 feet up the hole and lying at foot of tree there was a small heap of soft wood chips of the Woodpecker's excavating. Had it not been for the thorny spikes with which the stem was covered, the tree presented no difficulties in climbing. These spikes, however, we knocked off with a stick, and I swarmed up, but was disappointed to find I could not reach the bottom of the hole, as the entrance was too small to allow of more than the half of my forearm to pass through. The attendant with me could do no better. I then questioned him as to why he had told me that four days previously he had felt eggs, and he told me that at that time the hole was not so deep.

To-day I sent one of my servants, a small boy, whose arm would be likely to pass through the hole to feel in the nest for eggs, but alas quite contrary to my orders. Not only did he feel, but he took the two eggs and brought them back to me. Had I known there were eggs, I would have had them taken in my presence, and at the same time shot the parent bird.

The eggs are pure white, very glossy with a certain amount of transparency, and are fragile, considering their size. They measure 1·35 × 1·0.

Apparently the nest-hole was 1 foot deep, and as far as I could feel, almost the whole of the small tree had been hollowed out, and only a thin surrounding wall about 2″ in width being left.

The interesting point is, the bird, if my man's story is true, continued excavating after the eggs had been laid. Is this a usual practice with Woodpeckers I wonder? If so, it may be that the birds continue to excavate, as incubation of eggs progresses, in order to have a sufficiently large enough chamber prepared to receive the young.

The incubation of eggs I took had well set in, and in another 5 days would have been impossible to blow.

J. P. COOK.

CAMP, 6th *February* 1912.

No. XVII.—A KITE'S LARDER.

Yesterday I saw here a common Pariah kite (*Milvus govinda*) sitting on the edge of what appeared to be a large nest built in an Indian cork tree (*Millingtonia hortensis*), and as it refused to move, although several stones were thrown at it, I climbed the tree to see if the nest contained any eggs.

To my surprise I found that the nest contained no eggs, but a regular larder containing several dead squirrels, parroquets, crows and some old bones, all in various stages of decomposition, showing that the bodies had been placed there at various times. We had been shooting squirrels and parrots, etc., lately, as they had been a nuisance.

The nest appeared to belong to three kites, all of whom appeared to be adult birds, and all of whom came to the nest at various times to feed.

Is it a common practice amongst these birds to make a larder?

G. L. REMINGTON.

BANDIKUI, RAJPUTANA, 18*th February* 1912.

No. XVIII.—OCCURRENCE OF THE COMMON PEAFOWL (*PAVO CRISTATUS*, Linn) IN THE NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

The Common Peafowl (*P. cristatus*) has generally been supposed not to be a bird of high elevations, but this is hardly correct so far as these parts are concerned. It is common in the Ghana-ka-hati Jungles, (elevation about 5,500 feet), in the Dhami State, which are reserved for His Excellency the Viceroy, and which are not distant more than seven miles from Simla. Again it is found in considerable numbers below the cart-road in Patiala territory, about 8 or 9 miles from Simla, and at about an elevation of 5,000 feet. Lastly a pair of these birds, which were doubtless stragglers, were seen on the 25th April 1912, on the Kalka-Simla Railway line, a little beyond the Tara Devi Station (elevation 6,050 feet).

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 30*th April* 1912.

No. XIX.—SWINHOE'S SNIPE (*GALLINAGO MEGALA*) NEAR MADRAS.

I am sending you by registered parcel a specimen of Swinhoe's Snipe (*G. megala*) which I shot on 3rd March at Tindivanam some 75 miles south of Madras. I regret it is somewhat damaged. The specimen was skinned for me at the Madras Museum, and the measurement are those made by the Museum. The bird was only recognized on examining the bag on the homeward journey.

MADRAS, 20*th April* 1912.

R. F. STONEY.

There were several specimens of this snipe shot in Madras this season, all in the Chingleput district. Mr. R. F. Stoney had two, my partner Mr. Graham Ross shot one, and I had three.

I am afraid my partner and I would have passed them over as Pintails had we not known that Mr. Stoney shot one early in the season.

I. S. FRASER.

MADRAS, 26*th April* 1912.

No. XX.—CRUELTY TO WILD FOWL, &c., IN SIND.

While shooting in Manchar Lake during January and February, I have noticed the following cases of cruelty to wild fowl, &c., and should like to bring them to the notice of the Society:—

(*a*) *Egrets.*—These birds are caught and blinded, in order to prevent them escaping. Each bird I am informed yields about Rs. 6 worth of feathers, per annum.

(*b*) *Herons* are similarly blinded, kept in captivity, and used as decoys.

(*c*) *Duck, Geese, Coots, &c.*—A net ¼ to ½ mile long and about 7 feet high from the water is put out in a likely place. At night, men in boats approach the birds feeding near by and without putting them up drive them slowly in towards the nets; when near enough, lighted torches are thrown at the birds and thus suddenly alarmed they fly off low along the water and get entangled in the nets. The owners then take them out, *break their wings and very often their legs as well* to prevent them escaping and in this state keep them alive for days. My Shikari informs me that a good many are sent to Karachi for sale there.

Any day one can see four or five nets up and I believe that in a successful drive as many as two to three hundred birds are obtained.

Fishing by means of nets, night lines, spearing, &c., is carried on all the year through, no close season being apparently enforced.

C. H. ELLIOT, CAPT.,
58th Rifles, F. F.

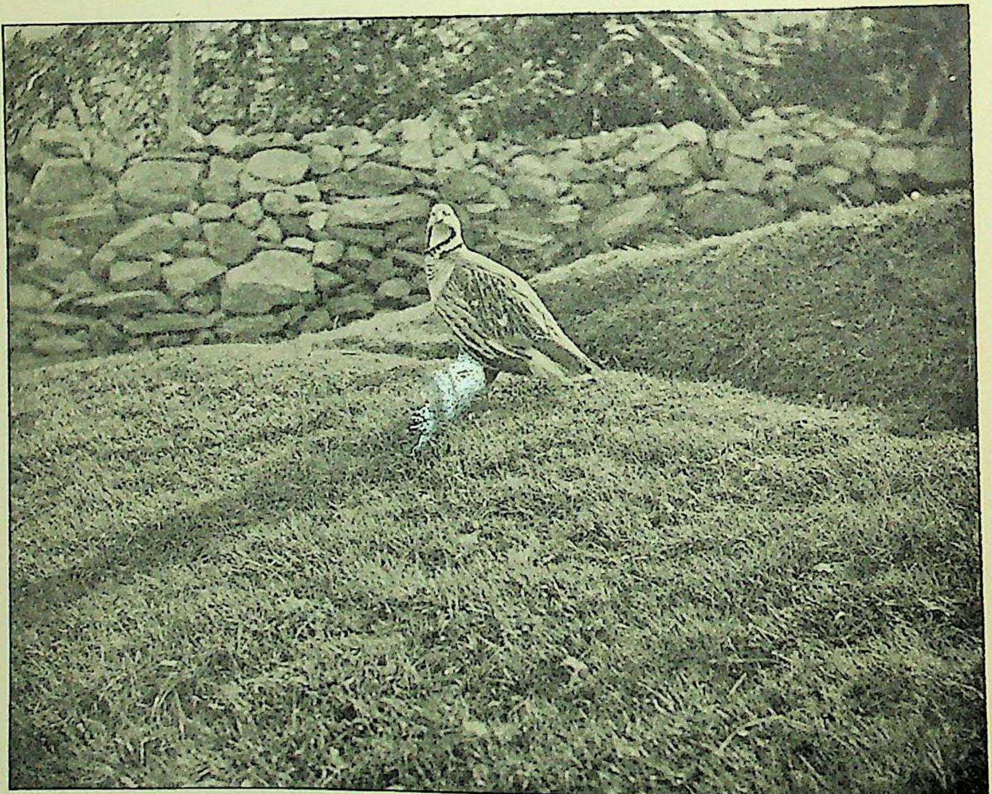
QUETTA, BALUCHISTAN,
11*th February* 1912.

[Major Magrath has already drawn attention in this journal and other papers to this abominable practice of maiming wild fowl in the Punjab. The Commissioner in Sind has informed us that he is making full inquiries with a view to such action as may be practicable.—EDS.]

No. XXI.—THE HIMALAYAN SNOW COCK (*TETROGALLUS HIMALAYENSIS*).

I send a photograph of the Himalayan Snow Cock, 'Ramchukor,' taken by me.

These birds were caught when quite young and now are free to roam about the garden and are very tame, as they will feed out of my hand when I whistle their call to them. Their plumage just at present is in its most perfect state, the heavy chess board game marking is very pronounced, the collar and ruff below the bill on the neck stands out very strongly as you can almost see the photograph. They are as heavy as a



good home capon. They are terrible gardeners; bulbs have no chance at all and any root they think good to eat is speedily dug up and demolished. I am sorry to say they are all female birds. The only cock was damaged by a fox and had to be put out of his misery. They spend a good deal of their time, especially in the evening, on the roof of the house and call splendidly, often about the same time as the Moslem Mullahs call to evening devotion. This certainly is the habit of these birds, to group in the evening on their mountain resorts, before they climb up into cliffs for the night. Eagles, and in the summer months foxes, are their deadliest foes. They are not easy to shoot, as they are wary to a marvellous extent, and their feeding grounds are pretty much the same as the Markhor and Ibex, and one rarely sees them therefore except when stalking the two latter lords of the mountains, and a shot gun has no place then.

W. G. APPLEFORD.

GILGIT, KASHMIR,
29th January 1912.

No. XXII.—WOODCOCK (*SCOLOPAX RUSTICULA*) IN SOUTH ANDAMANS.

I saw a Woodcock near the town of Aberdeen, South Andaman, on the 26th January. I send you a note of the occurrence as I do not remember to have heard of the woodcock being reported as yet from these Islands.

J. H. WHITEHEAD, MAJOR,
93rd Burma Infantry.

PORT BLAIR, ANDAMAN ISLANDS,
3rd February 1912.

No. XXIII.—NOTE ON THE HABITS OF SWINHOE'S REED-WARBLER (*UROSPHENA SQUAMICEPS*) AND ON THE NESTING OF THE BURMESE GREAT WOODPECKER (*THRIPONAX FEDDENI*).

I posted to you yesterday a box containing skins of (1) Swinhoe's Reed-Warbler (*Urosphena squamiceps*) and (2) Tweeddale's Scimitar Babbler (*Pomotorhinus nuchalis*).

Of the former bird Oates writes in the "Fauna of British India" (Birds, Vol. I): "This rare Warbler has been once procured at Bankasun in the South of Tennasserim, by Davidson * * * * * Nothing is known of its habits."

I found this bird comparatively common in the tract I have been touring in lately, *viz.*, the forests on the Eastern slopes of the Pegu Yomas or range dividing Sittang from Irrawady rivers situated about 60 miles due east of Thayetmyo.

The date of first bird seen was January 26th, the last occasion on which I noticed one, being March 12th. Between these dates I saw many birds and had good opportunities of watching their habits. They frequent the edges of densely forested streams, but one more partial to those parts where kaing grass grows. They feed mostly on the ground creeping about amongst the leaves in the thickest of scrub, but occasionally coming out into the sandy creeks hunting for insects amongst the drift-wood. I found one bird I shot had been feeding on very small black beetles found in the sand.

I only found the birds singly and they are hard to discover, until they make their presence known by their note, a soft low 'chip' 'chip,' this note being almost invariably uttered on being disturbed. They are by no means shy birds and not until they are approached very closely do they fly, or rather flit to some other bit of thick scrub.

I have been fortunate in obtaining for our Museum one good specimen, as it is very difficult to procure the birds without very much damaging the skins, as owing to their skulking habits, they have to be shot at a very close range and out of seven birds shot I only procured 4 specimens worth preserving.

Tweeddale's Scimitar Babbler (*nuchalis*) is a very common bird in the Pegu Yoma forests, but I thought our Museum would be glad to receive a specimen.

Great Black Woodpecker (*Thriponax feddeni*).—I have already reported the taking of this bird's eggs on February 6th. On the 18th of same month, I noticed another bird of the same species excavating its nest hole. I watched its nest and on March 1st took from it two fresh eggs.

Thriponax feddeni appears to be an early breeder and somewhat irregular, as just about the same date as I found the bird excavating its nest hole, my men found another nest of almost fully fledged young, the date being about February 17.

THAYETMYO, *March 26th*, 1912.

J. P. COOK.

[We are very glad to receive these skins which are new to our collection. —EDS.]

No. XXIV.—CHINESE GREY DUCK IN BURMA.

From the Rangoon Gazette, dated 16th January 1912.

I have great satisfaction in recording what I believe to be the first authentic record of the Chinese Grey Duck (*Anas zonorhyncha*) in Burma.

During our Christmas shoot at Tongyi, Mr. D. H. M. Boyle on 26th December was lucky enough to shoot one of a pair (female) of the above species. In the flesh the difference between it and the common Burmese Grey were most noticeable, and on comparison with a hen of that species the following points were noted.

Chinese Grey Duck (female).—Wing much more pointed, the 1st and 2nd quills being of the same length, 3rd $\frac{1}{4}$ inch shorter than 2nd, 4th $\frac{3}{4}$ inch shorter than 3rd, 5th $\frac{1}{2}$ inch shorter than 4th. The two conspicuous black shields (which are red in the true spotted-billed Duck) absent, their place being entirely covered with feather. The yellow patch at the end of the bill much narrower. The underwing coverts (inside wing) pure white. Breast and under parts tinged with rust colour, and boldly streaked with blackish brown, and not conspicuously spotted as in the Burmese Grey Duck. *Speculum*—Consisting of firstly, a very narrow irregular greyish white line, followed by a black one, both the above bars on the feathers immediately above a wide dark greenish blue band, below this another black band, some of the feathers narrowly edged with white. The outer edge of only one long secondary wing feather edged with white. In fact very little white in the wing when compared to the Burmese species. When fresh the coloured bar in the wing was a decided blue with a green tinge. It has now faded to a dull green. Legs much paler, in colour and not a bright red.

Burmese Grey Duck (female).—Wing rounded, and quill $\frac{1}{4}$ inch longer than 1st, 3rd equal to 1st, 4th quill $\frac{1}{2}$ inch shorter than 3rd, 5th quill $\frac{1}{2}$ inch shorter than 4th. The underwing coverts tinged with grey at their extremes. At base of the bill two conspicuous black shields. Breast and underparts spotted with round blackish-brown spots. *Speculum*—Firstly, a band about half an inch white, then a narrow black band. Then a broad dark green band followed by a black band, feathers below edged with white. The outer edge of *three* of the long secondaries edged with white. The green on the speculum being wider than in the Chinese Duck being on ten feathers while in that species it is on only eight feathers.

Burmese Grey Duck.—It may be as well to point out the differences between the sexes. The male, besides being larger in size, has the rump and tail coverts both above and below black glossed with green, the female dark-brown only. The male has more white on the secondaries, and breast more boldly spotted with black. Occasionally in old males the bright red feet edged with black.

I give below a list of the bags made at Tongyi, Tankobin, and Nawngmun (Shwepi) this last Christmas week, made by three different parties. Also the bags of Christmas shoots in 1895, 1896, kindly given me by Major W. H. Whitehead and Mr. E. Gabbett.

	Tongyi.	Nawngmun.	Tankobin.	Shwepi, 1895.	Shwepi, 1896.
Grey-lag Goose, *Anser rubrirostris*	25	34	13	23	46
Bar-head Goose, *Anser indicus*	..	..	..	1	..
Brahminy Duck, *Casarca rutila*	4	2	5	6	..
Nukhtas, *Sarcidiornis melanonota*	..	..	2	1	..
Burmese Grey Duck, *Anas haringtoni*	35	4	3	9	10
Chinese Grey Duck, *Anas zonorhyncha*	1	..	..	..	..
Pin-tail Duck, *Dafila acuta*	18	9	6	41	39
Gadwall, *Chaulelasmus streperus*	1	..	..	41	20
Widgeon, *Mareca penelope*	1	..	..	4	4
Shoveller, *Spatula clypeata*	1	1	..	34	35
Tufted Duck, *Fuligula fuligula*	19	64	24	53	122
Common Pochard, *Nyroca ferina*	..	..	..	..	3
White-eyed Pochard, *Nyroca africana*	3	..	..	18	20
Common Teal, *Nettion crecca*	36	10	32	52	41
Garganey Teal, *Querquedula circia*	22	..	16	23	142
Cotton Teal, *Nettapus coromandelianus*	..	..	1	0	29
Whistling Teal, *Dendrocycna javanica*	..	..	..	2	51

Note.—Burmese Grey-Duck.—Of the 35 shot at Tongyi, 3 showed slight traces of red on the bill evidently due to "spot-bill" blood and one each at Nawngmun and Tankobin, in none were the spots perfect.

White-eyed Pochard.—Major Whitehead says in 1895-96 he did not know the difference between the Eastern and Western birds, and some may have been the Eastern white-eye (*N. baeri*).

Whistling Teal.—Major Whitehead also says no account was kept of these whether they were the larger or smaller species.

Grey-lag.—Several shot this year, had the nail at the end of the bill dark horn colour instead of whitish. I could however see no other difference between them and the other grey-geese shot at the same time. This year there was a great deal of water about and birds not all plentiful. In Mr. Gabbett's note for 1896, he says very little water and birds plentiful.

H. H. HARINGTON, MAJOR.

XXV.—NIDIFICATION OF DAVISON'S BABBLER (*TURDINULUS EXSUL*).

During a recent visit to Mandaung (Toungoo Hills), I found the nest of Davisons's Babbler, *Turdinulus exsul* (186*a*). At least I think it must be this bird I shot off the nest. It is the same as is referred to on page 670 of the last number of the Journal as *Turdinulus roberti*. I will, in the meantime, describe the nest. It was in a screw-pine on a pad of dead bamboo leaves. From the pad other dead bamboo leaves seemed to have been made to stand up bound round with other leaves. The height from the pad was 6-inch ending in a dome. Entrance at side and very large for so small a bird. Below bottom of entrance was a hollow cup of fine grass. The whole like a shelter chair one sees at the seaside. The date was the ninth of April. Three eggs, pure white not smooth nor glossy, in shape a pegtop. One broken on nest. One my man broke. All very hard set. I gave the third to ants to clean, but they so discoloured it and ate the opening that I had to throw it away. Unfortunately I had not measured them.

RANGOON, 14*th May* 1912. S. M. ROBINSON.

No. XXVI.—THE SHELDRAKE (*TADORNA CORNUTA*) IN THE UNITED PROVINCES.

In November I shot a pair of Sheldrake in the Sitapur District, U. P., near the Ghogra river. I understand that these birds are very rare in this part of India.

MUSSOORIE, 20*th April* 1912. F. B. SCOTT.

No. XXVII.—NOTES ON SOME BIRDS FROM THE CHINDWIN VALLEY.

The following may perhaps prove of interest, as I do not think any of the birds enumerated have previously been recorded from the Chindwin.

1411. *Anthropoides virgo*—Demoiselle Crane. I saw and fired at a pair of these birds on a sand bank about 40 miles above Kindat on December 28th, 1911. As I had them under observation with a powerful glass for at least 10 minutes before firing, there can be no possible mistake. In view of our scanty knowledge of the Cranes of Upper Burma, it may be worth recording that Mr. Dove, Executive Engineer, tells me that when engaged on road work on the Chinese Frontier, near Bhamo, he frequently saw and several times shot Demoiselle Cranes. As I also recorded this species from Aracan, it is probable that the birds are fairly frequent visitors, at all events to Northern Burma.

1491. *Larus brunneicephalus*—Brown-headed Gull. On New Year's Day, 1912, I saw a single gull flying along the Chindwin river, not far from Monywa. I could not identify the bird with certainty, but have little doubt it belonged to this species, with which I was well acquainted in Aracan.

1609. *Fuligula fuligula*—Tufted Duck. I shot a male, one of a small flock, on January 5th, 1912, on a jheel about 30 miles south of Monywa.

1207. *Hieraëtus fasciatus.*—Bonelli's Eagle. On January 7th, 1912, when duck shooting, I found an eagle's nest on a cotton tree. On sending a man up, a large eagle, of a species unknown to me, flew off the nest and the climber reporting two eggs, I pursued and shot the eagle, which proved to be a fine female of the abovenamed species. The bird measured length 29·5 : tail 11 : wing 20·5 : tarsus nearly 4. The eggs, dirty white, faintly blotched at the large end with pale yellowish brown, measuring 2·64 × 2·2 and 2·72 × 2·2.

1255. *Falco peregrinator*—Shahin Falcon. On April 15th, 1911, I saw a falcon go into a cleft in a sandstone cliff on the river bank, about 60 miles above Monywa. The cliff was of no great height, and by letting a rope down from above, a man easily climbed up to the nest. He reported three young birds which I left, in the hope that the birds would breed again this year. Yesterday, March 7th, 1912, I again visited the spot and had the pleasure of taking from the same hole two beautiful eggs which proved to be about half set. With some compunction, I shot the male bird, which arrived with a parrot (*P. torquatus*) in his claws. Whilst the nest was being robbed, the female flew round screaming (she did the same last year); but made no attempt to attack the man, and she returned to the nest-hole as soon as we left. I much regretted shooting the male, as it turned out that my identification was correct, and his death was therefore unnecessary; but as these falcons are by no means uncommon, I have considerable hopes that the female may find another mate, and that more eggs may be forthcoming. There was no attempt at nest, the eggs being deposited on the bare earth. They are much more richly marked than the one described by Hume: the ground colour is pinkish, densely freckled all over with minute specks, and sparingly blotched at the small end with small spots varying in colour from rusty to sepia, the latter being less numerous than the former. The spots increase in size towards the large end, where they coalesce to form a rust-coloured cap speckled with sepia. The eggs measure about 2·1 × 1·5.

1553. *Anastomus oscitans*—The Open-Bill. I have just noticed that this bird is put down by Blanford as being unknown in Burma except in Aracan and Pegu. As a matter of fact, it is common enough on the jheels of the Lower Chindwin, though I do not recollect seeing it in the Upper Chindwin.

CYRIL HOPWOOD,
D. C. Forests.

MONYWA, U. BURMA, 17*th March* 1912.

No. XXVIII.—BAIKAL OR CLUCKING TEAL (*NETTION FORMOSUM*) SHOT IN ASSAM.

I am sending the Society the skin of a Baikal or Clucking Teal which was shot near Sibsagar, Assam, in January or February 1910 by Mr. Morton Eden.

Mr. Eden had no idea that he had shot a Baikal Teal till he had gathered the duck shot, some 40 or 50. It was apparently amongst a flock of Common Teal.

Most of our shooting is done in the fog starting at daybreak, as when the fog lifts, all good ducks go off towards the Brahmapootra. It would not be an easy matter to recognize birds under these circumstances; you hear the rush of wings and it takes you all your time to mark where they are coming from, and if you are not very quick they pass before you realize this.

DEKHARI TEA CO. DEOHALL DIVN.,
ASSAM, *February* 1912. FRANCIS W. GORE.

Mr. Harrison has written to me with reference to a Clucking Teal *(Nettion formosum)* he shot near Lainekusi as follows:—"On the 24th of February last, in company with Mr. R. S. Pearson, Forest Economist, Dehra Dun, I visited a Bhil close by here to look for duck, a flock of Gadwall *(Chaulelasmus streperus)* got up and flew over Mr. Pearson; one solitary Teal flew in my direction which I shot. We both decided that it was an uncommon specimen. The bird made no sound at all and flew like a Common Teal."

DIBRUGARH, *3rd May* 1912. EVAN A. EVANS.

No. XXIX.—INSECTS IN THE NESTS OF THE COMMON SWIFT (*CYPSELUS AFFINIS*).

On examining the nests of these Swifts I noticed that some of them swarmed with insects, which I thought were parasites of these birds. The Hon'ble N. C. Rothschild has recently identified these insects as beetles belonging to two species of Dermestidæ; the one being *Anthremus fasciatus*, Hbst., and the other an *Attagenus*. This gentleman adds *in epist*:—"I do not think that the specimens in question are really parasites of the Swift; in fact, I feel sure, they are not, but the larvæ feed on old feathers and similar refuse, which explains their presence."

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.
SIMLA, S. W., *30th April* 1912.

No. XXX.—DISTRIBUTION OF THE CRICKET *SCHIZODACTYLUS MONSTRUOSUS.*

It may be of interest to note in regard to the distribution of *Schizodactylus monstruosus*, I have frequently found this curious cricket whilst digging in sandy soil in the vicinity of Campbellpur and Nowshera. It would seem, therefore, that it has a much wider distribution than given by Lefroy in his "Insect Life in India." Natives have assured me that this insect feeds on flesh.

MULTAN, *16th March* 1912. W. P. C. TENISON, LIEUT., R.F.A.

No. XXXI.—INTELLIGENCE OF ANTS.

Last year I kept some colonies of ants in glass nests, as recommended by Lord Avebury. One evening I placed some golden syrup near a nest. In the morning, instead of the clear syrup, I found a thick black paste. I took this away and put a fresh supply of syrup. One or two ants came and felt it with their antennæ, and then went off and returned with dry grains of dust, bits of stick, etc., and placed them on the edge of the syrup. After a short time the edge of the syrup became firm enough for the ants to mount on it without sticking, and so they gradually converted the whole into a stiff paste. They then moulded the paste into little balls with their jaws and antennæ and thus carried it into their nest.

MUSSOORIE, 20*th April* 1912. F. B. SCOTT.

No. XXXII.—THE CASTOR RUST (? *MELAMPSORELLA RICINI*, De Toni).

With plates A & B.

* The rust on Castor was first described about the year 1815 by A. de Bivona-Bernardi as *Uredo ricini* occurring in Sicily. Later on it was described as *Cæoma ricini* by Von Schlechtendahl in "Fungorum novorum et descriptorum Illustratione publicat" in Linnæa, Vol. I, p. 612, 1826, the *Uredosori* being apparently taken for *Aecidia* of the *Cæoma* type. In 1878 again it was named *Melampsora ricini* (Biv-Bern) Pass. by G. Passerini in Baglietto F. de Cesati V. and de Notaris G. "Erbario crittogamico Italiano" Ser. II, Fasc. XIV, No. 684. The name was yet again changed by de Toni in Saceardo's Sylloge, Vol. VII, p. 596, to *Melampsorella ricini.* It is still doubtfully referred to the genus *Melampsorella*, presumably on account of the similarity of its Uredo stage to that of *Melampsorella caryophyllacearum* (D. C.) Schroet.

I am indebted to Dr. Butler, Pusa, for letting me see a specimen with description and figure from Briosi and Cavara's "Funghi parasite delle piante coltivate," fasc XV, No. 355. The general appearance of the European specimen resembles closely that of the Indian Castor Rust, but unfortunately there was not enough of the European material to allow me to study it under the microscope. This description is rather incomplete as are also the other references to this fungus mentioned above. The rust was first recorded for India in the "Annales Mycologici" in Sydow and Butler's "Fungi Indiæ Orientalis" under the name *Melampsora ricini* in 1906. But no description or figure is given.

So far only the Uredo stage is known, although search has been made for other stages during two years. The generic name of the fungus, therefore,

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*The historical information contained in the 1st paragraph was kindly supplied to me by Dr. E. J. Butler, Imperial Mycologist, Pusa, India.

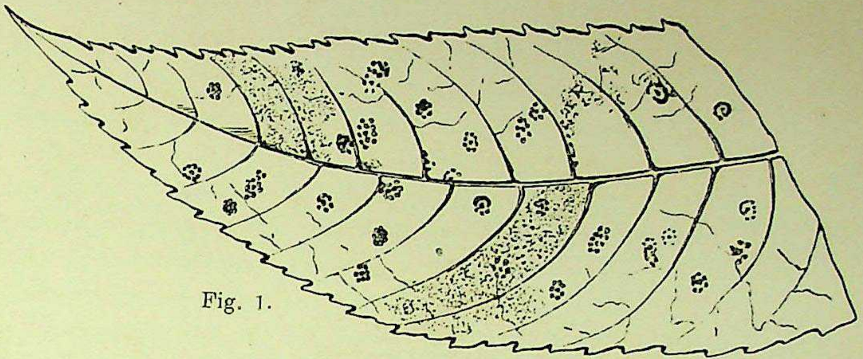


Fig. 1.

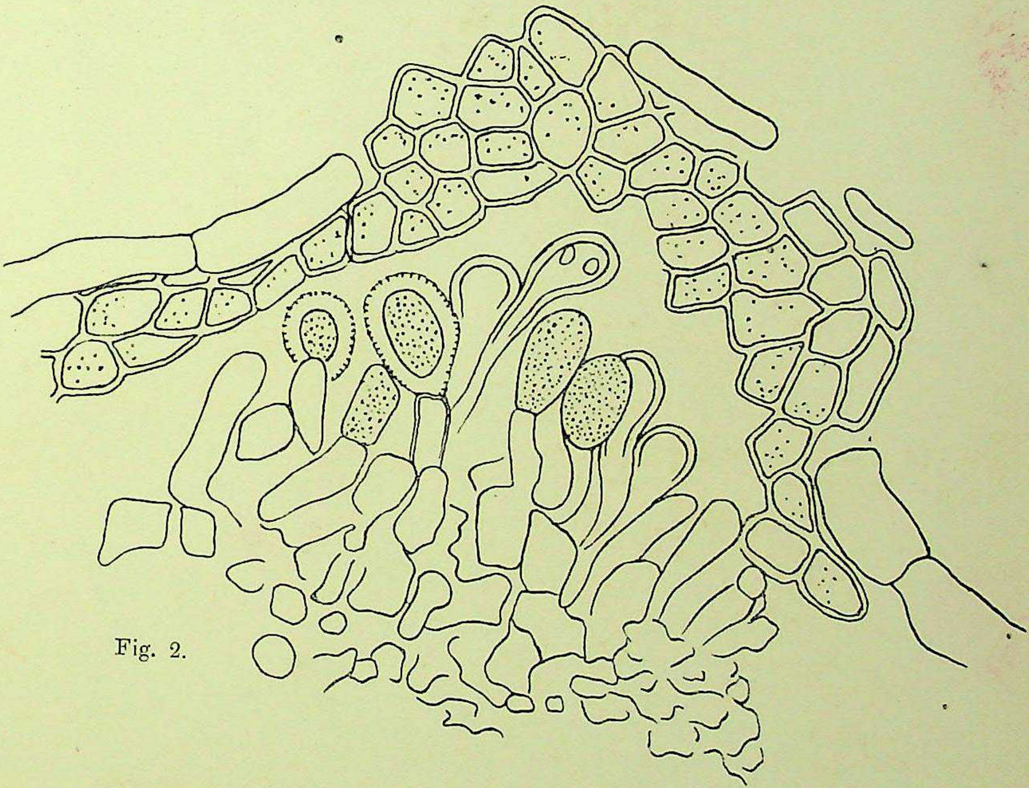


Fig. 2.

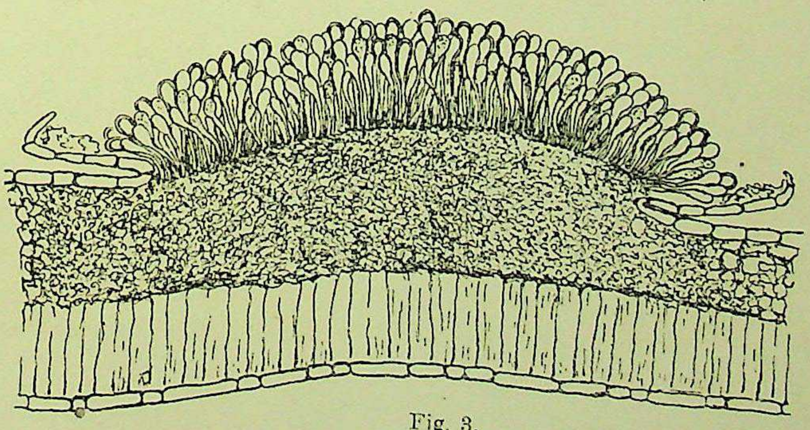


Fig. 3.

CASTOR RUST.

must still remain doubtful. It is thought desirable, in the meanwhile, to describe in detail the fungus as it occurs in the Indian specimens.

The rust is very common on the Castor plant in the Poona, Belgaum and Dharwar districts of the Bombay Presidency. It is remarkable that it is practically absent from Gujerat, though the varieties commonly grown there are by no means immune to this disease. Plants of all the common Gujerat varieties were grown for experimental purposes on the Poona Agricultural College Farm and these all got the rust.

This rust usually appears between the months of November and February on Castor sown in June as an annual crop. But it has been observed as early as September on some Castor plants more than a year old in the Ganeshkhind Botanical Garden, Kirkee, and from the appearance of the leaves which were entirely covered with pustules, the rust had presumably been there all the summer. The attack is severest in January when practically every leaf of the plant is thickly covered with pustules, and clouds of spores are blown off from them on shaking the plant.

The orange yellow, powdery pustules (Uredosori) are confined to the leaf and occur chiefly on the lower surface, though very rarely they are met with on the upper surface also. They are indicated on the upper surface by minute roundish yellow spots. They occur in large numbers and not infrequently show an arrangement in concentric rings (Fig. 1), and they often run together. In severe cases this arrangement in rings is lost and the entire surface is covered thickly with pustules.

A transverse section of the leaf through a young pustule shows that the Uredo spores are first covered entirely by a peridium consisting of fungus tissue of polygonal cells. (Fig. 2). When mature they become exposed by rupture both of epidermis and peridium, which latter can still be seen as a layer underlying the epidermis. (Fig. 3). The spongy parenchyma below the epidermis is more or less completely occupied by the hyphæ of the fungus which form a sort of a cushion on which the spore-bearing hyphæ arise. The spore-bearing hyphæ separated by manipulation present a characteristic appearance. They are curiously branched and, as a rule, only two of these branches bear spores, the oldest spore being always at the top. (Fig. 4). The other branches are slender, pointed and sterile. Further the Uredo spore bearing hyphæ are intermixed with stout, club-shaped, paraphyses, generally colourless but occasionally the swollen heads showing orange colour. (Fig. 5 *a* & *b*). In the last case the paraphyses are easily distinguishable from the spore-bearing hyphæ by the perfectly smooth outline of their swollen heads. In mature sori the paraphyses generally project beyond the level of the spores.

The Uredo spores are globular or elliptical, echinulate and with orange contents. When examined fresh in distilled water it is possible to distinguish between two kinds of Uredo spores, one with thick walls and the other with thin walls. (Fig. 6). There are no gradations between them. This observation recalls a similar one recorded for *Melampsorella aspidiotus* in Engler and Prantl's Naturlichen Pflanzenfamilien I-Teil I-Abteilung, p. 45. It was at first believed that these really represented two distinct kinds of Uredo spores and that the thicker walled spores were of the nature of Amphispores, which, (according to Arthur quoted in McAlpine's "The rusts of Australia") "are developed in arid or subarid regions, being provided with thickened walls to enable them to withstand unfavourable conditions, just like a teleutospore." But further observations throw a considerable doubt on this matter. If the spores from leaves kept dry in the herbarium for a month or two are examined, the proportion of thick-walled spores to thin-walled ones appreciably increases, suggesting that the thin-walled spores may develop a thick wall later on under certain conditions. Again after treatment with lactic acid, the distinction between thin-walled and thick-walled spores practically disappeared, the thin walls swelling almost to the size of the thick walls. The difference in the appearance of the spores examined fresh is, however, so striking that it is considered worth recording.

The fresh spores germinate in distilled water, readily in the months of January and February. The germination is poor earlier in the season. The two kinds of spores germinate alike. (Fig. 7). More than one germ tube are generally protruded but only one grows out finally, the other becoming disorganised. The largest number of germ tubes observed is five, four being the commonest number. The largest number of germ spores observed is six.

The size of the spores varies from 25-29″ × 19-25″.

No other spore form has been observed so far. An Aecidium was found on some Brinjal plants growing in the neighbourhood of the Castor plants on the Agricultural College Farm, Poona. This has been identified, provisionally, with *Aecidium habunguensis* by Dr. Butler. A few inoculation experiments carried on with the Aecidiospores of this gave negative results and there is at present no clue to answer the question whether the rust on Castor has any other spore forms or whether it is one of those rust fungi whose life cycle is restricted to the Uredo stage.

DESCRIPTION OF FIGURES.

(Figures 1 and 3 are free hand drawings. The rest are drawn with Camera lucida.)

Fig. 1.—Portion of rusted leaf of *Ricinus communis*. Natural size.

Fig. 2.—Transverse section of leaf through a young sorus, showing peridium × 860.

Fig. 3.—A mature sorus × 120 about, showing ruptured epidermis and peridium.

Fig. 4.—A spore-bearing hypha separated by manipulation × 400.

Fig. 5.—Uredo-spore-bearing hyphæ and paraphyses × 400.

Fig. 6.—A thin-walled and a thick-walled spore × 500.

PLATE B.

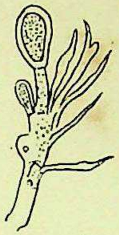


Fig. 4.

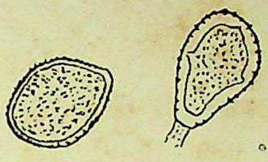


Fig. 6.

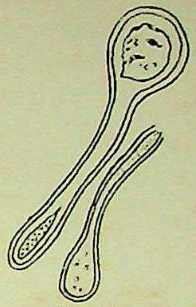


Fig. 5b.

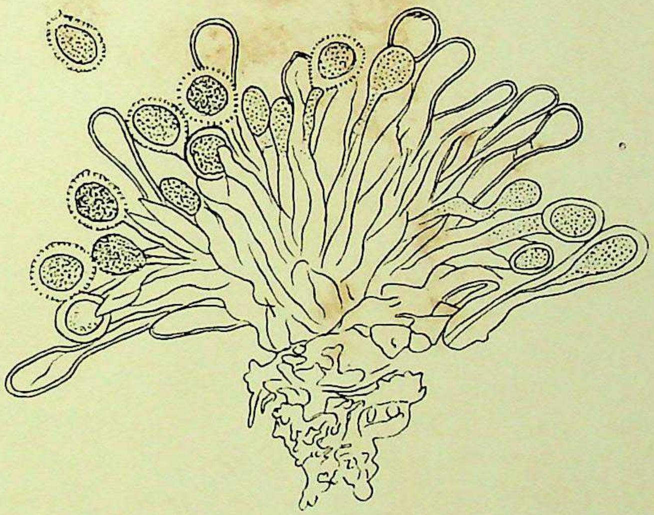


Fig. 5a.

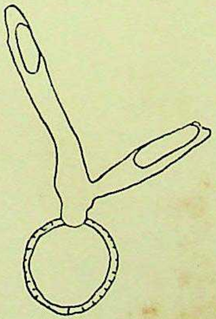


Fig. 7a.

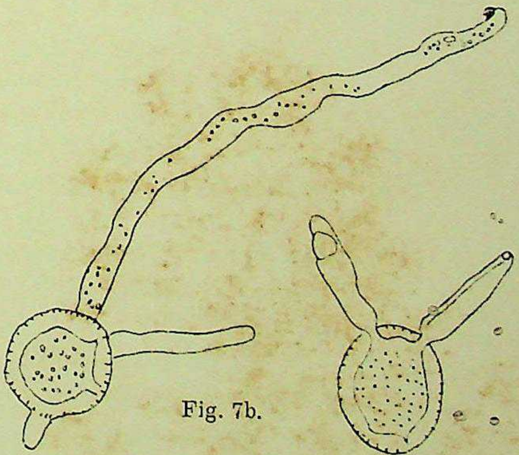


Fig. 7b.

CASTOR RUST.

Fig. 7.—Germinating Uredo spores (*a*) thin-walled (*b*) thick-walled ×500.

S. L. AJREKAR, B.A.,
Assistant Professor of Mycology.

AGRICULTURAL COLLEGE,
POONA, *January* 1912.

No. XXXIII.—NOTES ON CACTI IN NORTH-WEST INDIA.

A considerable number of plants belonging to the Cactaceæ are to be seen in cultivation in N.-W. India, and a few of them have obtained sufficient footing to deserve mention in local floras. The following plants as far as I have observed are firmly established and are capable of holding their own against, or even extending at the expense of the indigenous vegetation :—

Opuntia, Sp. No. 1.—About four feet in height, as a rule spineless, occasionally 1 (—3) spines in some of the tufts of bristles. Leaves $\frac{1}{8}$ in. long, conical, green or reddish. Joints dull, greyish-green, thick, very uniform in size, usually about 6 by $2\frac{1}{2}$ in. Flowers yellow.

The commonest species in the Plains of the Punjab between the Jhelum and the Sutlej, elsewhere it appears to be less common than other species.

Opuntia, Sp. No. 2.—About five feet in height. Spines in tufts of 4-6, the largest very stout awl-shaped, often somewhat curved, pale yellowish-brown with a horny appearance, $1\frac{1}{2}$ in. long, bristles numerous, conspicuous. Leaves pale green, conical, $\frac{1}{8}$ in. long from a broad base. Joints large, dull, bluish green, relatively not thick, usually about $\frac{12}{16}$ by $\frac{6}{8}$ in. more or less undulate when looked at edgeways and at the margin. Flowers yellow. Found with the above but not quite so frequent. Planted in hedges in Rawalpindi.

Opuntia, Sp. No. 3.—About ten feet in height or even more. Very like Sp. No. 2 but spines slender, grey and opaque except when quite young, not curved. Leaves subulate, recurved, reddish at the tip, $\frac{1}{3}$ in. long. Joints not undulate, relatively rather thin. Flowers orange.

Common on the Ridge at Delhi and at and around Jaipur.

Opuntia, Sp. No. 4.—About six or eight feet in height. Spines at first one or several of which one is considerably larger than the rest, as the joints get older the number of spines in a tuft increases by the growth of fresh spines till in old stems as many as ten spines may be seen in each tuft. Leaves dark-brown, slightly recurved, $\frac{1}{4}$ in. long. Joints bright green, very variable in size and shape, narrow-oblong to broad obovate, usually 12 by $\frac{3}{4}$ in. sometimes $2\frac{1}{2}$ feet long and broad in proportion. Flowers yellow.

Widely distributed but not common in the Plains, the only species at all common in the Sub-Himalayan tract. Haripur, Abbottabad, Mansehra, Shinkiari, &c., in Hazara, in the Rawalpindi District not common, frequent throughout the Kangra District at suitable elevations, at many places in Hoshiarpur and Ambala Districts, Solon and Nirth in Simla District. In the Plains at Jaipur, Phillaur, Amritsar, Lahore, &c., but less common than other species.

The question arises as to the identification of these species. The various local floras follow the Flora of British India and mention *Opuntia dillenii*, Haw. which cannot cover more than one of these species. An article has appeared in the Records of the Botanical Survey of India, Vol IV., No. 6., by Mr. Burkill called 'Determination of the Prickly Pears now wild in India,' in which the following species are mentioned for the area in question:—*O. monacantha*, *O. cochinelifera*, and *O. elatior*. Of these *O. cochinelifera* belonging to the sub-genus *Nopalea* I have not mentioned among the four species, which all belong to the sub-genus *Eu-Opuntia*, shortly described above, as I have not seen it except in gardens and hedges in Lahore where it is by no means frequent.

The article referred to does not give any description of the species dealt with, but the following key to the species of Eu-Opuntia is given:—

Spines falling except one long one on each cushion.	*O. monacantha.*
Several large spines remaining on each cushion.	
Spines all straight, slender, tawny or purplish-black:	
Flowers orange.	*O. nigricans.*
Flowers at opening lemon yellow changing to rose-pink.	*O. elatior.*
Spines some curved, the largest stout, light horn colored in life, darkening in herbaria with age.	*O. dillenii.*

None of the species I mention would, according to this key, appear to be *O. monacantha.* No. 1 is, perhaps, the nearest, but in this species the spines do not 'fall leaving only one long one on each cushion,' because as a rule there are no spines at all. *O. monacantha* is referred to as a species on which the cochineal insect lives, and of my species No. 4. is the only one I have seen attacked. In 1906-07 I noticed the cochineal insect on species No. 4, throughout the Kangra District, almost every clump being attacked and in process of destruction. In 1909 I saw the same thing on the same species in the Hazara District, but in a more advanced stage. Here the remains of large clumps of Opuntia were common, the plants as a rule being quite dead, though here and there a few could be seen sprouting up from the root. Burkill mentions that *O. monacantha* has recently been used much for clothing hillocks in Lahore! Now the species used for this purpose is my No. 1, and on it the cochineal insect apparently will not live. When in the Kangra District I made a hedge of species No. 4 together with a few plants of No. 1, almost immediately after planting the former was attacked by the cochineal insect, whereas the latter escaped completely. It is I think evident that Burkill's *O. monacantha* refers to two species. Species No. 2 according to the key would appear to be *O. dillenii*, and No. 3 *O. nigricans*.

I have endeavored to identify the Opuntias I have mentioned with the help of Schumann's 'Gesamtbeschreibung der Kakteen,' which is I believe the standard work on the subject. Species No. 1 is, I believe, *O. ficus indica*, Mill., or a closely allied species. Species No. 2 is *O. tuna*, Mill. (Schumann gives *O. dillenii*, Haw. as a synonym). Species No. 3 is very close to *O. nigricans*, Haw., if it is not that species. Schumann remarks that *O. nigricans*, Haw. is related to *O. tuna*, which is certainly true of my No. 3, but Schumann says the flowers of *O. nigricans*, Haw. are yellow. Burkill says the flowers of his *O. nigricans* are orange and that *O. elatior*, differs from *O. nigricans* in the flower being lemon yellow at opening, he identifies the Opuntia at Delhi and Jaipur as *O. elatior*. I agree that the Opuntia at Delhi is the same as the one at Jaipur, I have not seen the flowers of the former place but I saw them at the beginning of the flowering season in Jaipur, and whether just open or still in bud the petals were orange and hence according to the key this Opuntia is *O. nigricans*. The most obvious explanation of the confusion seems to be that *O. elatior* and *O. nigricans* are really one species, the flowers of which are either yellow or orange. Species No. 4 is *O. monacantha*, Haw. Burkill mentions one species of Cereus in his article, *viz.*, *C. pterogonus*, though he does not record it from any place in N.-W. India. There is a large columnar Cactus in this region, it is used by villagers for fencing their fields in and around Anandpur, District Ambala, I have not seen it elsewhere except in gardens. This Cactus is not *Cereus pterogonus*, Lem. it is probably *Cereus peruvianus*, Mill.

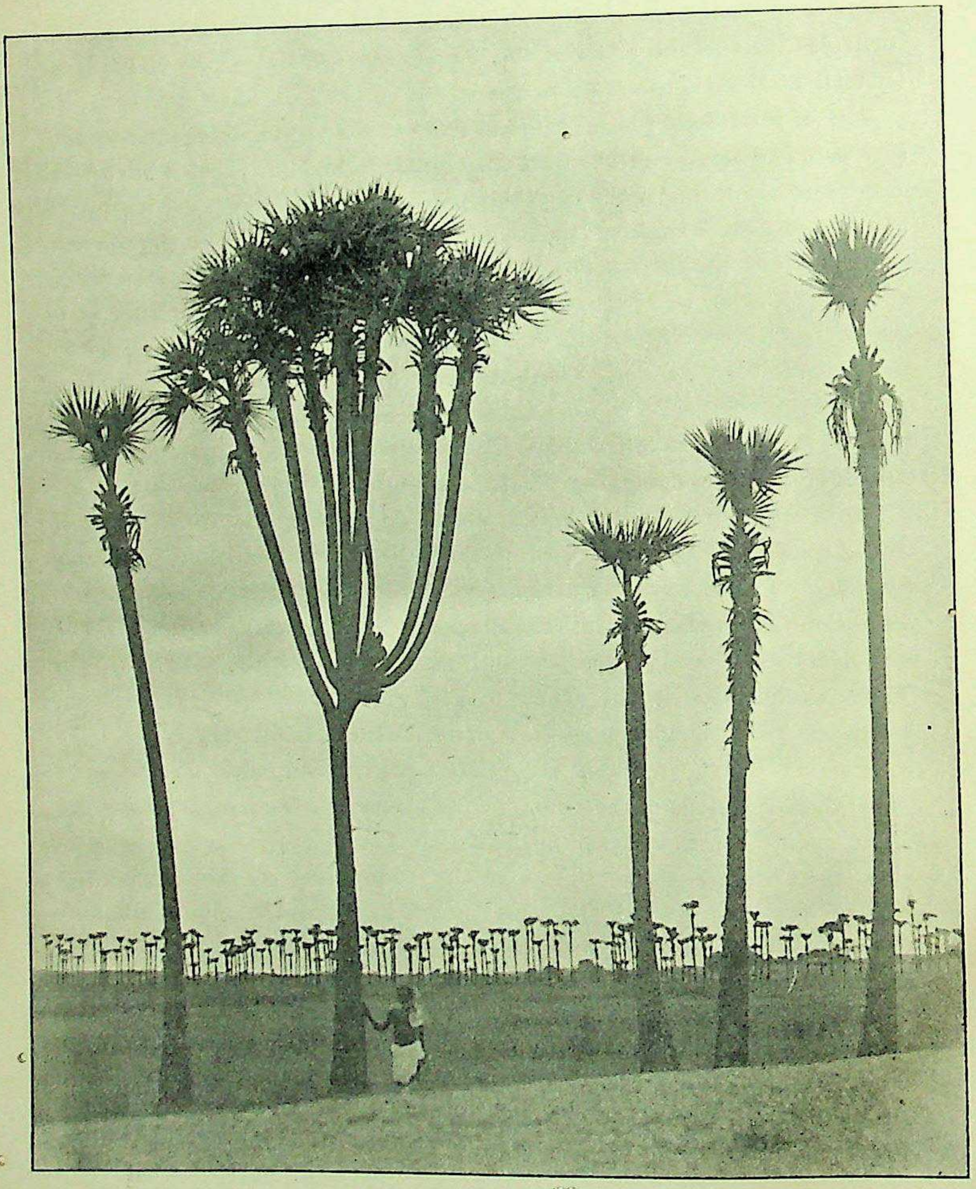
The spreading of Opuntias is interesting to study, the fruits ripen of all the species I have mentioned, those of No. 1 in abundance, and they are eaten to some extent by birds, yet birds have little or no share in the spreading of the plants at any rate in N.-W. India. In the plains I have never seen young Opuntias springing up to any distance from old clumps such as one would expect if they were spread by birds. During nearly two years' residence in the Kangra District I took every opportunity to examine young *Opuntia monacantha* plants and with one possible exception found none of the young plants had arisen from seed. They are spread mainly if not entirely by cuttings either planted in hedges by man or by joints broken off by wind or cattle, taking root as they lie on the ground. On steep ground Opuntias spread fairly rapidly down hill and joints are sometimes transported by water and may be found rooting on banks of streams where they have been deposited by floods. In the case of species No. I, and *O. monacantha* the whole fruit after dropping off may take root in the same way as a joint, in fact occasionally they do not fall off the mother plant but sprout and grow just as a joint would. Except in these two species I have not observed the rooting of the whole fruit, but it may perhaps occur with all the species.

R. N. PARKER,
D. C. Forests.

LAHORE, 23*rd May* 1912.

No. XXXIV.—A BRANCHING PALMYRA PALM (*BORASSUS FLABELLIFER*).

The accompanying photograph (taken by Mr. E. L. Richardson of the S. I. R.) is of a rather remarable Palmyra palm which is growing in the neighbourhood of Tanjore. The tree at present has eight separate heads, and must at one time have had several more, as the stumps can be clearly seen.



MADRAS, 15*th December* 1911.

R. F. STONEY.

No. XXXV.—RATE OF GROWTH OF A DHAMAN (*ZAMENIS MUCOSUS*) HATCHLING.

On the 15th September I received a clutch of 22 dhaman eggs. Some of these were opened and found to contain fully formed embryos measuring 15·5 inches. Ten eggs were placed in wet straw and allowed to hatch out. Of these, three hatched on the 20th September, one on the 21st, three on the 25th and two on the 28th. One egg did not hatch, but when opened contained a fully formed dead embryo. One of the snakes that emerged on the 20th measured 16·1 inches, while one that hatched on the 28th measured 16·5 inches.

Accounts of the hatching of dhaman eggs and observations on the egg tooth have already appeared in the Journal (Vol. XVII, page 1033); so my intentions were to ascertain the rate at which a hatchling grew and the periods at which it sloughed; but as my subject only lived for a very short period, I give my results for what they are worth.

A hatchling of the 28th, which measured 16·5 inches, was tempted with frogs and lizards, but it refused to eat; nevertheless small frogs and agamoids were carefully thrust down its throat, and by this means I was able to keep it alive for over a month. In all it ate three young agamoids and thirty-six small frogs, and one day, when no frogs were available, some flesh of a rat was administered in small quantities. After two weeks it measured 18 inches and after a month 19 inches, that is to say, in confinement it had grown 2½ inches in a month. It died after the fifth week, but during the fifth week it did not seem to have grown at all. It sloughed on the 5th October, *i.e.*, about a week after leaving the egg, and it showed signs of sloughing a second time on the 25th October, for in handling, the epidermis of the anterior half of the body came away in one piece.

E. A. D'ABREU, F.Z.S.

NAGPUR, C.P., *February* 1912.

No. XXXVI.—THE RUPTURE OF THE EGG-SHELL IN THE *GENUS CALOTES*.

Before reading Capt. Venning's interesting note on the hatching of *Calotes jerdoni* in the last Number of the Society's Journal, I had sent to "Spolia Zeylanica" one on the same phenomenon in *Calotes nigrilabris*. So far as the external appearance of the egg just before the young lizard emerges is concerned, my observations agree closely with Capt. Venning's; but I can find no trace of an egg-tooth in my specimens, and indeed, it is hard to see how a structure of that nature could produce the oblique parallel slits and triangular flap so clearly shown in his figures. My own opinion is that the slits are produced by the long claws of the forefoot.

The manner in which the embryo is packed in the egg and also the nature of the cuts strongly favours this view.

N. ANNANDALE.

INDIAN MUSEUM, CALCUTTA.
May 14th, 1912.

No. XXXVII.—CHINESE GOLD FISH—*CARASSIUS AURATUS.*

I obtained 19 of these gold fish on January 27th, 1912, in the Old Chinese City of Shanghai, where they are bred in large earthenware pans by the Chinese for sale, each pan containing fish of different shapes, sizes and colours, very dirty water and water weeds and they are fed on water insects and rice. In all the gardens of the Chinese houses these fish are kept in little ponds or jars with rocks and ferns round and made pets of by the family, the more ugly the fish the better they are prized and looked after. The various forms are obtained by taking the eggs of the single-tailed variety and shaking or disturbing them, unnatural developments take place and fish with double tails, bulging or goggle eyes, eyes on top of the head-tufted fins and tails, no dorsal fins, &c., are the result; these, if carefully selected, will breed the same kind again.

When the female spawns, the eggs are removed from the big pan to a smaller bowl, as the males eat the eggs; they are then hatched by the heat of the sun. The young fish are nearly black, but gradually become white or red, and later gold, silver or black fish; some attain the large size of 2 feet and live to a great age, and a few of these may be seen in the Chinese public gardens of the old city. Chinese gold fish were first brought from Lake Tsau in the Province of Ngan-Kwin, China.

I placed the 19 fish in two large earthenware jars filled with the dirty water and weeds, with enough water insects for 10 days, food and brought them on board keeping them in a bathroom. On the 3rd day out from Shanghai, I changed them into a marble bath, as the temperature was getting high and the big fish looked sick, giving them fresh cold water which I then changed daily. On February 6th, the first big fish died; February 7th, 4 died; February 8th, 4 more died and February 9th, 1 died, I then removed the 9 back to the earthenware jars and gave up hopes of getting any to Bombay; but from that day to the time of writing, Feb. 14, no more have died. I feel sure that the cause of death was the heat after coming from dead winter and large fish were too fat.

I have two gold fish in my cabin, which I bought in the same place three years ago, and they are quite well and lively, but they have not grown at all.

P. & O. "ARCADIA,"
BOMBAY HARBOUR, *January* 1912.

F. H. S. STONE.

No. XXXVIII.—HORSE-MACKEREL ATTACKING JELLY FISH.

In the book entitled "The Story of Life in the Seas" by S. J. Hickson, F.R.S., page 100, he mentions that it is very probable that none of the Fish will feed upon a transparent Jelly fish. Whilst the P. & O. S.S. "Arcadia," was moored in the Inner Harbour of Aden last March, and on a very calm day, I and several of the other officers saw the following.

A large number of purple Jelly fish were round the ship and on the surface, each one about one foot across the back and all with very long tentacles; suddenly a small shoal of Horse-mackerel (*Caranx* sp.) dashed at one of these Jelly fish and began tearing and biting off the tentacles and apparently eating them; the Jelly fish could do nothing and was turned over and until at last there was nothing left but the upper part of the belly (body); then this shoal made for and attacked another in the same way, whilst other shoals were killing three more Jelly fish. The Horse-mackerel were only about 6 inches long, and our native crew caught quite a number of them. It is strange, as I believe the Jelly fish is quite a foster mother to very young Horse-mackerel, dozens of them are to be seen swimming about the tentacles of large Jelly fish, where they seem to get for protection.

F. H. S. STONE.

P. & O. S.S. "ARCADIA,"
HONG-KONG, CHINA, *February* 1912.

PROCEEDINGS

OF THE MEETING HELD ON 14TH MARCH 1912.

A MEETING of the members of the Bombay Natural History Society took place on Thursday, 14th March 1912, at the Society's Rooms, Mr. John Wallace, C.E., presiding.

NEW MEMBERS.

The election of the following 24 new members since the last meeting was duly announced :—

Lt. G. H. A. Pearson (Jullundur, Punjab); Mr. R. W. L. Dunlop (Bombay); Mr. H. N. Randle (Benares); Capt. J. F. C. Carter (Bassein, L. Burma); Mr. G. Somerville (Bassein, L. Burma); Mr. G. A. Levett-Yeats (Ghazipur); Mr. E. O. Bloch (Rangoon); Mr. H. M. Chibber, M.A. (Poona); Major G. P. Evans (Malakhand); Capt. W. J. Massy (Myitkyina, U. Burma); Mr. H. B. Player (England); Mr. P. S. Quarry (Jessore, Bengal); Mr. C. W. Skinner (Dehra Dun, U. P.); Mr. A. C. Rumboll (Bombay); Mr. J. R. Phillips (Insein, Burma); Mr. J. C. C. Wilson (Papun, Burma); Mr. F. Boxwell (Cachar, Assam); Mr. O. H. Walters (Rawalpindi): Capt. J. A. Scarlett, R.H.A. (Transvaal); Mr. V. N. Ffolliot Powell (Beawar); H. E. Lord Carmichael, G.C.I.E., K.C.M.G. (Madras); the Marquis of Bute (Edinburgh, Scotland); Mr. C. E. Aitken, P. W. D. (Mirpurkhas) and Dr. P. V. Casling, I.S.M.D. (Rawalpindi).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Tiger (*Felis tigris*) skull ..	Mishmi Country ..	Mr. W. J. H. Ballantine.
1 Golden Cat (*Felis temmincki*) Skin.	Akyab, U. Burma.	Commander Willock, R.I.M.
1 Large Indian Civet (*Viverra zibetha*) Skin.	Bhamo District ..	Major W. B. T. Abbey.
3 Skins of Wild Dogs (*Cuon dukhunensis*) puppies.	Saugor, C. P. ..	Mr. D. O. Witt, I.F.S.
1 Giant Squirrel (*Ratufa gigantea*).	Abor Country ..	Mr. G. M. McCleverty.
1 Pallas's Squirrel (*Sciurus erythraeus*) and Stevens's Squirrel (*Sciurus stevensi*).	" " ..	Do.
Head and fœtus of large brown Flying-Squirrel (*Pteromys candidulus*).	" " ..	Dr. J. N. Faulkner.

Contributions.	Locality.	Donor.
1 Burmese Mole Rat (*Gunnomys varius*).	Rangoon	Dr. H. Marshall.
1 Painted Bat (*Kerivoula picta*). ..	Colombo	Mr. F. H. Stone.
6 Bats in Spirit	Ratnagiri ..	Mr. G. S. Hardy, I.C.S.
6 Pairs of Takin Horns (*Budorcas taxicolor*).	Mishmi Country..	Mr. W. J. H. Ballantine.
17 Bird Skins	" " ..	Captain F. Bailey.
13 Bird Skins	Hasimara, Duars..	Mr. H. V. O'Donnel.
1 Wall Creeper (*Tichodroma muraria*).	Raipur, Kangra..	Mr. Lionel Donaldson.
1 Red Turtle-Dove (*Œnopopelia tranquebarica*).	Meerpur, Champaram.	Mr. M. Mackenzie.
1 Great White belied Heron(*Ardea insignis*).	Hasimars, Duars..	Mr. H. V. O'Donnel.
Grey Lag Goose (*Anser cinereus.*).	Munchar Lake, Sind.	Mr. P. M. D. Sanderson.
Comb Duck (*Sarcidiornis melanonotus*).	Sunjval, Sind. ..	Mr. R.L. McCulloch.
Baikal Teal (*Nettium formosum*). ..	Dibrugarh, Assam.	Mr. Evan E. Evans.
" " (" ") ..	Sibsagar, Assam..	Mr. F. W. Gore.
Pintal Snipe (*Gallinago stenura* semialbino).	Calcutta.. ..	The Hon. Mr Justice Chitty.
Jack Snipe (*Gallinago gallinula*) dark variety.	Thar and Pakar..	Mr. E. Priestley.
Johns Earth Snake (*Eryx johhnii*).	Lucknow.. ..	Major J. H. Hudson.
Russell's Earth Snake (*Eryx conicus*).	Santa Cruz ..	Mr. R.W.L. Dunlop.
1 Green Whip Snape (*Dryophis mycterizans*).	Colombo	Mr. F. H. Stone.
1 Buff Striped Keelback (*Tropodinotus stolatus*).	Colombo	
1 Snake (*Helicops schistosus*). ..	Colombo	
1 Snake (*Zamenia fasciolatus*), and two Sea Snakes.	Persian Gulf ..	Captain F. W. Townsend.
1 Cobra (*Naia tripudians*). ..	Andheri	Col. K. R. Kirtikar, I.M.S. (Retd.)
1 Snake and a Lizard	Anamally Hills ..	Mr. T. Bainbrigge Fletcher.
2 Lizards (*Calotes ophiomachus*) (alive)	Colombo	Mr. F. H. Stone.
1 Chameleon (*Chamæleon calcaratus*)	Jholwad	Mr. A M. D'Cruz.
6 Ceylonese monitors	Colombo	Mr. F. H. Stone.
9 Gold Fish (*Carassius auratus*) alive.	Shanghai.. ..	
4 Fishes & 2 Crustaceans ..	Persian Gulf ..	Captain F. W. Townsend.

Contributions.	Locality.	Donor.
2 King Crabs and some Oysters, etc.	Various	Mr. F. H. Stone.
80 Moths and Butterflies	Various	
20 Pieces of Coral	Singapore ..	
150 Fossils	Bhuj, Cutch ..	Mr. J. H. Smith.

Minor contributions from :—Mr. T. Bainbrigge Fletcher, Mr. A. Gover, Capt. C. Thornhill and Mr. G. Arnold.

ADDITIONS TO THE LIBRARY.

Zoogeography Physical Atlas, 1911 ..	(Bartholomew, Clarke and Grimshaw).
Birds of Uganda	(Van Someren).
Unexplored Spain	(Abel Chapman and Walter J. Buck).
My life among the wild birds in Spain	(Willoughby).
By Mountain, Lake and Plain ..	(Major R. L. Kennion).
Thirteen years among the wild beasts of India	(G. P. Sanderson).

ACCOUNTS FOR 1911.

Mr. L. H. Savile, the Honorary Treasurer, in submitting a statement of the accounts for the year ending 31st December 1911, said :—I beg to call attention to the fact that the opening balance at the beginning of the year was Rs. 2,960-10-11, and the closing balance was Rs. 2,494-7-9, showing an excess of expenditure over income of Rs. 466-3-2. Although this is not a very large deficit, when compared with last year, which showed a surplus of Rs. 8,485-9-3 it is a serious falling off. With regard to the receipts which are Rs. 3,037-3-4 less than in 1910, the subscriptions are Rs. 600-0-1 less, entrance fees Rs. 1,079-4 less and sale of Duck Book Rs. 2,424-12-6 less. This latter source of income was practically expected to cease this year as the issue was nearly all sold last year, but what is more serious is the reduction in the amount of entrance fees, meaning as it does that the number of new members joining has decreased by 118. While the receipts have diminished, the expenditure has gone up by Rs. 4,945-15-10 as compared with last year, the principal items of increase being rent for the additional rooms taken over Rs. 750, salaries of staff Rs. 1,131-10-10, Journal account Rs. 3,302-8-3. These increased expenses are all very necessary if the Society is to carry on the work it has undertaken and the way in which members can best assist in helping on this work is to induce others to join the Society or in agreeing to a substantial increase of the annual subscription.

A separate account has been opened during this year to deal with the finances of the MAMMAL FUND which has been started for the purpose of making a mammal survey of India. The amount subscribed to this fund up to 31st December 1911 was Rs. 23,530-1, the expenditure to the same date being Rs. 7,786-15, showing the balance in hand of Rs. 15,743-2. Two collectors are now working on the collection of mammals for this survey, and provided funds are forthcoming, they will continue until a survey of the whole of India and Burma has been completed. The expenses of the two collectors amount to about Rs. 750 per mensem.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office bearers for the present year:—*President:* H. E. the Right Hon'ble Sir George Sydenham Clarke, G.C.M.G., G.C.I.E., F.R.S.; *Vice-Presidents*: Mr. J. D. Inverarity, B.A., LL.B., Rev. Fr. Dreckmann, S.J., and the Hon. Mr. Justice N. C. Macleod; *Hony. Secy.*: Mr. W. S. Millard; *Honorary Treasurer*: Mr. L. H. Savile; *Honorary Librarian*: Mr. P. M. D. Sanderson; *Managing Committee*: Mr. E. C. Stuart Baker, F.Z.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. Wm. Burns, Mr. E. Comber, F.Z.S., Lt-Col. G. H. Evans, F.L.S., C.I.E., Capt. W. H. Evans, R.E., Prof. G. A. Gammie, Mr. E. Ernest Green, F.E.S., Mr. N. B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.)., Mr. H. Maxwell Lefroy, M.A., F.E.S., F.Z.S., Major W. G. Liston, I.M.S., Mr. J. McNeill, I.C.S., Dr. A. Powell, Mr. G. M. Ryan, I.F.S., Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E. and Mr. T. Bainbridge Fletcher.

The members and their friends spent the evening in the Museum examining the Society's collections. Among the exhibits were 155 skins of mammals which had just been received from Mr. G. C. Shortridge (the Society's Collector), from the South Dharwar District. These specimens were being forwarded to the British Museum for identification and return.

EXHIBITS.

Mrs. W. H. Deakin exhibited a collection of marine shells made by her in Back Bay, Bombay, and also some beautiful paintings of flowers. Mr. C. D. Mahaluxmivala, Superintendent, Victoria Gardens, exhibited 3 orchids in flower—*Dendrobium parishii, ochreatum* and *gratissississimum.*

OF THE MEETING HELD ON 9TH APRIL 1912.

An "At Home" of the members of the Bombay Natural History Society took place on Tuesday evening, 9th April 1912, Rev. F. Dreckmann, S. J., presiding.

NEW MEMBERS.

The election of the following 11 new members since the last meeting was announced:—Mr. M. F. Delaney, Bombay; The Secretary, Rawalpindi Club, Rawalpindi; Mr. J. D. Way, Nowrangpur, Vizagapatam District; Lt. H. E. Shortt, I.M.S., Benares; Mr. John Stewart, Travancore; Mr. V. A. Mendoza, Bombay; Mr. J. E. Webb, Bilaspur, C.P.; Mr. E. Maconochie, I.C.S., Dharwar; The Inspector of Schools, Surma Valley and Hill Districts, Silchar, Assam; Mr. G. A. Laughton, Uran, Kolaba District: and Mr. W. P. Appleford, Gilgit, Kashmir.

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Skin Domestic Cat (*Felis domestica*) yellow variety.	Ahmednagar ..	Lt.-Col. J. Girvin, R.A.M.C.
3 Bats (in spirit)	Ratnagiri ..	Mr. G. S. Hardy, I.C.S.
1 Hare (*Lepus ruficaudatus*) skin	Aibheel, Assam ..	Mr. W. P. Field.
8 Bird skins	Meerut	Mr. H. C. Jeddere Fisher.
3 Do. do.	Thayetmyo, Burma.	Mr. J. P. Cook.
26 Eggs of 6 species of birds ..	Kashmir ..	Mr. H. C. Jeddere Fisher.
1 Common Snipe (*Gallinago cœlestis*).	Tonk, N. W. F. P.	Mr. C. R. Pitman.
3 Eggs of common Sandgrouse (*Pteroclurus exustus*).	Khandwa, C. P...	Mr. C. H. Dracott.
1 Lizard and 4 toads	Palni Hills ..	Mr. C. E. C. Fischer
43 Butterflies and Moths ..	Various ..	Mr. H. C. Jeddere Fisher.
115 Butterflies	Nilgiris ..	Captain G. Hare.

Minor contributions from Captain H. Thornhill, Mr. W. D. Cumming and Mr. J. Florence.

EXHIBITS.

No fewer than 265 specimens of mammals from the Central Provinces collected by the Society's Collector (Mr. C. A. Crump), and a number of specimens of mammals from the S. W. Dharwar and East Kanara Districts (collected by Mr. G. C. Shortridge) were exhibited and admired. These specimens were being forwarded to the British Museum for identification and return.

MAMMAL SURVEY.

The Secretary announced that he had just received an intimation that the Royal Society had been good enough to sanction a grant of £25 towards the survey of the Mammalian fauna of India, Burma and Ceylon organized by the Society. The Government of Madras had also kindly promised the sum of Rs. 2,500 towards this survey. It had been found that the area to be covered was so enormous that the survey would, with only two collectors, take much longer than was at first estimated and it became necessary therefore to obtain a further Rs. 30,000 or Rs. 40,000 in order that the survey might be thoroughly carried out, and it was hoped that members and others would send in subscriptions to enable the Society to accomplish this scientific work.

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Printed by E. G. Pearson for the Proprietors of the Times Press, Bombay, and published by

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Printed by E. G. Pearson for the Propri

Compiled
1998-2000

Printed by E. G. Pearson for the Proprietor